

DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

**THE RELATION BETWEEN PEDESTRIAN
EXPERIENCE AND WALKABILITY MAPS:
A CASE STUDY IN İZMİR**



by

Bochra MENSI

October, 2021

İZMİR

THE RELATION BETWEEN PEDESTRIAN EXPERIENCE AND WALKABILITY MAPS: A CASE STUDY IN İZMİR

**A Thesis Submitted to the
Graduate School of Natural and Applied Sciences of Dokuz Eylül University
In Partial Fulfillment of the Requirements for the Master of
Urban Design Program**

**by
Bochra Mensi**

**October, 2021
İZMİR**

M.Sc THESIS EXAMINATION RESULT FORM

We have read the thesis entitled “**THE RELATION BETWEEN PEDESTRIAN EXPERIENCE AND WALKABILITY MAPS: A CASE STUDY IN İZMİR**” completed by **BOCHRA MENSI** under supervision of **PROF. DR. EBRU CUBUKCU**, and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

.....
Prof. Dr. Ebru CUBUKCU
Supervisor

.....
Asst. Prof. Dr. Ahu DALGAKIRAN
ERDOĞAN
(Jury Member)

.....
Prof. Dr. Sedef DOĞANER
(Jury Member)

.....
Prof. Dr. Özgür ÖZÇELİK
Director
Graduate School of Natural and Applied Sciences

ACKNOWLEDGMENTS

Firstly, I would like to thank my supervisor, Prof. Dr. EBRU CUBUKCU, for providing guidance and feedback throughout this work. And, I would like also to thank my family member, for their support and encouragement. This work is dedicated to my beloved father soul.

Bochra MENSİ



THE RELATION BETWEEN PEDESTRIAN EXPERIENCE AND WALKABILITY MAPS: A CASE STUDY IN İZMİR

ABSTRACT

In recent years, the importance of creating walkable neighborhoods has been highlighted repeatedly by decision makers and improving cities' walkability has remained as the unsolved mystery for urban design practitioners and researchers. Most of these studies investigated where people are walking based on pedestrian density and focus on the relation between physical environmental characteristics and people's tendency to walk. However, how well those studies reflect pedestrian behavior is unclear. This thesis aims to fill the gap in walkability studies, understand the pedestrian experience in urban settings and investigate the relation between environmental characteristics and pedestrian behavior.

This thesis aims to fill (1) develop a methodological guide for how the on-site observations should be conducted and what kind of data should be collected systematically as an indicator of pedestrian experience, (2) evaluate whether the pedestrian behavior is influenced by variances in physical environmental characteristics. The empirical study was conducted in the district of Karsiyaka in Izmir city as it represents the general layout of the other neighborhoods in Izmir and in Turkey. Within the scope of the thesis, firstly, 136 tracked pedestrian were observed and their walking behavior was investigated via 5 parameters (walking distance, time and speed, route choice and activities). Then, the pedestrian behavior was compared across different environmental qualities. The results showed that the pedestrian behavior differs by the physical environmental characteristics. This study is expected to contribute to the research area with its methodological proposal to track pedestrian behavior. It also has applied value to guide urban design practitioners to promote walkability.

Keywords: Pedestrian experience, pedestrian behavior, Walkability, physical environment, urban design.

YÜRÜNEBİLİRLİK HARİTALARI VE YAYA DENEYİMLERİ: İZMİR ÖRNEĞİ

ÖZ

Son yıllarda, karar vericiler tarafından yürünebilir mahalleler yaratmanın önemi defalarca vurgulanmış olsa da, kentlerde yürünebilirliğin iyileştirilmesi hala kentsel tasarım uygulayıcıları ve araştırmacıları için çözülmemiş bir gizem olarak kalmıştır. Bu çalışmaların çoğu yaya yoğunluğuna göre insanların nerede yürüdüklerini araştırmış ve fiziksel çevrenin özellikleri ile insanların yürüme eğilimleri arasındaki ilişkiye odaklanmıştır. Ancak, bu çalışmaların yaya davranışını ne kadar iyi ölçtüğü tartışmalıdır. Bu tez, yürünebilirlik çalışmalarındaki bu boşluğu doldurmayı, kentsel çevrelerde yaya deneyimini anlamayı ve çevresel özellikler ile yaya davranışı arasındaki ilişkiyi araştırmayı hedeflemektedir.

Bu tez ile, (1) yaya deneyiminin bir göstergesi olarak, yerinde gözlemlerin nasıl yapılması gerektiği ve sistematik bir şekilde ne tür verilerin toplanması gerektiği konusunda bir gözlem yöntemi kılavuzu geliştirilmesi, (2) yaya davranışının farklı fiziksel çevre özelliklerinden etkilenip etkilenmediğini değerlendirilmesi amaçlanmaktadır. Ampirik çalışma, İzmir ve Türkiye'deki diğer mahallelerin genel özelliklerini kapsaması ve temsil etmesi nedeniyle İzmir ilinin Karşıyaka ilçesinde gerçekleştirilmiştir. Tez kapsamında öncelikle 136 yayaya ait yürüme mesafesi, yürüme süresi, güzergah seçimi, hızı ve yürüyüş sırasındaki aktiviteleri olmak üzere 5 yürüme davranışı parametresi irdelenmiştir. Daha sonra yaya davranışı, farklı mekânsal kaliteye sahip alanlar arasında karşılaştırılmıştır. Sonuçlar, yaya davranışlarının farklı mekansal koşullarda değiştiğini göstermiştir. Bu çalışmanın, yaya davranışını izlemeye yönelik metodolojik önerisiyle araştırma alanına katkı sağlaması ve yürünebilirliği arttıracak tasarım kriterlerini belirlemeye yönelik çalışmalar için de bir rehber olması beklenmektedir.

Anahtar kelimeler: Yaya deneyimi, yaya davranışı, Yürünebilirlik, fiziksel çevre, kentsel tasarım.

CONTENTS

Page

M.Sc THESIS EXAMINATION RESULT FORM.....	ii
ACKNOWLEDGMENTS	iii
ABSTRACT.....	iv
ÖZ	v
LIST OF FIGURES	ix
LIST OF TABLES	x
 CHAPTER 1 - INTRODUCTION.....	 1
1.1 Motivation	1
1.2 Scope of The Study	1
1.3 Structure of The Thesis	2
 CHAPTER 2 – LITERATURE REVIEW	 3
2.1 Definition of Walkability	3
2.2 Benefits of Walkability	5
2.3 Pedestrian’s Experience and Walkability	6
2.4 Empirical Studies on Walkability.....	8
2.5 Case Context.....	13
 CHAPTER 3 - RESEARCH METHODOLOGY	 16
3.1 Literature Review (Previous Studies on Measuring Pedestrian Behavior)	16
3.2 Research Method (Pilot Studies)	19
3.2.1 Pilot Study 1	19

3.2.2 Pilot Study 2	23
3.2.3 The Data Collection Method	27
3.3 Case Study	31
3.3.1 Observation Point/ Origin Point	32
3.3.2 Road Intersection (RI)	33
3.3.3 Public Transportation Connectivity (TC)	34
3.3.4 Destination Variety (DV)	35
3.3.5 Observation and Data Collection.....	36
3.3.5.1 K1: Zone K	36
3.3.5.2 K2: Zone K	36
3.3.5.3 K3: Zone K	36
3.3.5.4 K4: Zone K	37
3.3.5.5 K5: Zone K	37
3.3.5.6 K6: Zone K	37
3.3.5.7 B1: Zone B.....	37
3.3.5.8 B2: Zone B.....	38
3.3.5.9 B3: Zone B.....	38
3.3.5.10 B4: Zone B.....	38
3.3.5.11 B5: Zone B.....	38
3.3.5.12 B6: Zone B.....	39
3.3.6 Examples of Tracked Pedestrians	42
3.3.6.1 Id :101232	42
3.3.6.2 Id: 143141	42

CHAPTER 4 - RESULTS AND ANALYSIS.....	43
4.1 Walking Behavior.....	43
4.1.1 Walking Distance.....	43
4.1.2 Walking Time	47
4.1.3 Route Choice	50
4.1.4 Walking Speed.....	53
4.1.5 Activities while Walking	56
4.2 General Results on Pedestrian Behavior and Physical Environmental Features.....	64
4.2.1 Walking an Act of Socialization.....	64
4.2.2 Walking Pace, Pedestrians Density and Influence of The Interaction with The Environment.....	65
4.2.3 Pedestrian Comfort	67
4.2.4 Sidewalk and Pedestrian Area	67
4.2.5 Crossing the Street.....	69
4.2.6 Use of Parks	69
CHAPTER 5 - CONCLUSIONS.....	70
REFERENCES.....	73
APPENDICES	81

LIST OF FIGURES

	Page
Figure 2. 1 Conceptual framework of walking behavior	10
Figure 3. 1 Recorded walking path of tracked pedestrian.....	20
Figure 3.2 Pilot 1(Friday, 01 March 2019): Walk trip and route choice	22
Figure 3.3 Pilot 2 (Thursday, 07 March 2019): Walk trip and route choice.....	25
Figure 3.4 Study area and observation points.	32
Figure 3.5 Variable road intersection (RI): Major, minor and pedestrianized roads in study area.....	33
Figure 3.6 Variable public transportation connectivity (TC): Izban Metro station, Ferry boat station and Tramway station.....	34
Figure 3.7 Variable destination variety (DV): commercial areas and residential areas	35
Figure 3.8 Characteristics of origin points based on RI, TC and DV variables.....	40
Figure 4.1 The route taken by pedestrian.....	51
Figure 4.2 The shortest route	51

LIST OF TABLES

	Page
Table 2.1 Streetscape features related to urban design qualities – walkability.....	11
Table 3.1 Pilot 1(Friday, 01 March 2019): walk trip and pedestrian behavior.....	21
Table 3.2 Comparing studies on on-site observation	23
Table 3.3 Pilot 2(Thursday, 07 March 2019): walk trip and pedestrian behavior	26
Table 3.4 Indicators to define the walking purposes.....	30
Table 3.5 Characteristics of origin/ observation points	39
Table 3.6 Tracked, dropped and studied pedestrians in Zone K and Zone B	41
Table 4.1 Minimum, maximum, and average values of walking distance in zone K	44
Table 4.2 Minimum, maximum, and average values of walking distance in zone B	44
Table 4.3 Minimum, maximum and average values of walking distance according to public transportation connectivity TC.....	44
Table 4.4 Minimum, maximum, and average values of walking distance according to destination variety DV	45
Table 4.5 Minimum, maximum, and average values of walking distance according to road intersection RI	45
Table 4.6 Walking distance more than 500m in zone K and zone B	46
Table 4.7 Walking distance more than 500m according to Public transportation connectivity TC	46
Table 4.8 Walking distance more than 500m according to road intersection RI	47
Table 4.9 Walking distance more than 500m according to destination variety DV ..	47
Table 4.10 Minimum, maximum, and average values of observed time and walked time in zone K	48
Table 4.11 Minimum, maximum, and average values of observed time and walked time in zone B	48
Table 4.12 Minimum, maximum, and average values of walked time according to public transportation connectivity TC.....	49
Table 4.13 Minimum, maximum, and average values of walked time according to destination variety DV	49

Table 4.14 Minimum, maximum, and average values of walked time according to road intersection RI	50
Table 4.15 Route choice of tracked pedestrians in zone K and in zone B	52
Table 4.16 Route choice of tracked pedestrians according to public transportation connectivity TC	52
Table 4.17 Route choice of tracked pedestrians according to destination variety DV	53
Table 4.18 Route choice of tracked pedestrians according to road intersection RI...	53
Table 4.19 Walking speed of tracked pedestrians in zone K and zone B	54
Table 4.20 Walking speed of tracked pedestrians according to transportation connectivity TC	54
Table 4.21 Walking speed of tracked pedestrians according to destination variety DV	55
Table 4.22 Walking speed of tracked pedestrians according to road intersection RI	55
Table 4.23 Classification of necessary or utilitarian activities and optional or recreational activities.....	56
Table 4.24 Pedestrians engaged in at least one activity in zone K and zone B	57
Table 4.25 Pedestrians engaged in at least one activity according to public transportation connectivity TC.....	57
Table 4.26 Pedestrians engaged in at least one activity according to destination variety DV	58
Table 4.27: Pedestrians engaged in at least one activity according to road intersection RI.....	58
Table 4.28 Activities pedestrians engaged while walking in zone K	59
Table 4.29 Activities pedestrians engaged in while walking in zone B.....	59
Table 4.30 Pedestrian that engaged in both types of activities	60
Table 4.31 Activities pedestrians engaged in while walking according to public transportation connectivity TC.....	61
Table 4.32 Activities pedestrians engaged in while walking according to destination variety DV	62
Table 4.33 Activities pedestrians engaged in while walking according to road intersection RI	63

Table 4.34 Utilitarian activity type according to destination variety DV	63
Table 4.35 Type of shopping activities according to destination variety DV.....	64



CHAPTER 1

INTRODUCTION

1.1 Motivation

This thesis aims to fill the gap in walkability studies and understand the pedestrian experience. This study focuses on pedestrian experience and investigate the relation between environmental characteristics and pedestrian behavior (rather than pedestrian density). In other words, majority of studies investigated where people are walking based on pedestrian density and focus on the relation between physical environmental characteristics and people's tendency to walk (or to use other means of transportation). Such studies assume higher pedestrian densities indicate higher pedestrian pleasure or better environmental qualities attract more pedestrians. However, those studies fail to observe actual pedestrian behavior while walking, understand pedestrians' experience and analyze which routes they chose among various alternatives in different settings.

Human population has been increasing tremendously throughout the world despite the finite resources to support the ecosystems. However, the numbers are not evenly distributed, with the urban areas being dense while most rural parts of the world are scarcely populated. The United Nations Department of Social and Economic Affairs (UN DESA, 2018) shows that currently 55% of the world's population lives in urban areas with the proportion expected to increase to 68% by 2050. The case is not different in Turkey. According to the world bank data (Eurostat, 2018), 74,4% of the Turkish population is living in the urban areas in 2017 which is above the world average. Given that this study focusses on pedestrians in urban areas rather than those in rural areas.

1.2 Scope of The Study

In this section, the content and the focus of this thesis will be defined.

Without doubt, as the pedestrian share in the transportation system declines so as the vitality in neighbourhoods in urban environments. Decision makers in

municipalities aim to encourage people to walk more via design to improve the social and cultural quality of urban living. Nowadays, various cities, neighbourhoods in developed countries published walkability maps. However, how well those maps reflect pedestrian behavior is unclear.

This study aims to develop a methodology to measure the pedestrian experience in selected urban areas. Pedestrian experience on streets with various walkability scores will be investigated to understand the influence of the physical environmental and social / demographic characteristics on pedestrian behavior. In brief, this study aims to understand the relation between environmental characteristics and pedestrian behavior.

1.3 Structure of The Thesis

This thesis has five chapters. First chapter discusses the importance of the study. Chapter 2 reviews the literature on this topic, summarizes the definitions for walkability, highlights the importance and benefits of walking and the role of the built environment in promoting walkability. Chapter 3 discusses the methodology used to measure walkability and define how pedestrian behavior and experience can be understood via “systematic observations”. Chapter 4 and 5 discusses the results and concludes with discussion of the results, the recommendations to improve walkability in the case area and the limitations of the present study which may trigger future studies.

CHAPTER 2

LITERATURE REVIEW

“There is much more to walking than walking” (Gehl, 2010, p. 19)

(Jan Gehl, 2010).

This chapter starts with a discussion of the existing definitions and meanings of the terms: walkable and walkability. Next, the benefits of walking are presented. Then, the role of walkability in the pedestrian experience will be presented. Finally, the existing studies and guidelines which discuss the design qualities that support pedestrian mobility will be reviewed.

2.1 Definition of Walkability

In recent years, the importance of creating walkable neighborhoods has been highlighted repeatedly by decision makers. Yet, how the physical environmental features in cities can promote residents’ tendency to walk remained as the unsolved mystery for urban design practitioners and researchers. Many studies have been carried out on walkability. Most of these studies have been conducted by practitioners, researchers, and decision-makers from various fields, namely urban planning, transportation, urban design and public health. The main motives for those studies are found to solve numerous problems such as obesity, lack of central city vibrancy to traffic congestion, environmental injustice or social isolation (Forsyth, 2015). In other words, it is believed that urban residents should be encouraged to walk to decrease obesity, environmental injustice and social isolation in the society.

If walkability is to promote a healthier, environmental-friendly and socially active communities, there would seem to be a case for discussing the concept. Forsyth (2015) argued that *“What exactly is meant by walkability”* and *“the related idea of the walkable place?”* needs to be discussed in a comprehensive way. In order to answer these questions, first the definition of the terms would be explored.

According to Compact Oxford English Dictionary (2020), the term “walkable” first appeared in the 18th century. However, in contrast “walkability” is a more recent word. The word is frequently used but it is rarely defined. It can have several definitions depending on the field, most of which have emerged in planning fields in the USA (Forsyth, 2015).

Let’s start with the term “walking”. “Walking” or “to walk” is the activity of getting on foot from point A to point B. It is the most basic form of human movement. For example, in an urban context, walking is recognized as the shortest distance between two points. Yet it is much more than moving from one point to another point and from one place to another place. Jan Gehl in his seminal book “Cities for people” (2010) argues that the quality of public space, where the social activities occur in the surrounding environment, have to be considered. Many factors contribute the encouragement of people to walk more. One of these factors is the characteristics of the built environment (Moudon et al., 2006).

“Walkable” is defined as a term that is used to describe to which extent a street, environment, neighborhood, city, etc., or a distance/ of a destination is suitable or safe for walking (Oxford English Dictionary & 2020 and Merriam-Websters, 2020). In other words, a walkable environment supports walking between local destinations rather than using other modes of transportation. Moreover, Peñolosa (Lo, 2009), mayor of Bogotá, Colombia, argued that walkable environments are classified as “*more democratic*” and “*civilized cities*”, when compared to roads or rail improvements, since anyone has access to it - pedestrian facilities, infrastructure and destinations - regardless of their socioeconomic status. Walkable neighborhoods also promote sociability between neighbors and interaction with the surroundings in order to create a pleasant place and “*livable communities*” (Emery & Crump, 2003).

The term walkability was discussed in the discipline of planning by Chris Bradshaw in the 1990s. Bradshaw (1993) developed a rating system (or a model) which is called “Walkability Index” in order to measure how walkable the neighborhoods of Ottawa. It was defined as “the quality of a place”, which is based on 4 characteristics: (1) a

“*foot-friendly*” man-made, physical micro-environment; (2) a range of useful, active destinations within walking distance, such as shops; (3) a natural environment that moderates the extremes of weather and has no excessive pollution; and a (4) local culture that is social and diverse (Bradshaw, 1993).

Although there is no simple definition of walkability, it is typically defined as the measurement of how “*pedestrian-friendly*” an area is. Walkability is the extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network (Southworth, 2005). Given that, walkability can be considered as both an end and a means, as well as a measure (Speck, 2012).

2.2 Benefits of Walkability

Walkability has taken attention of practitioners, researchers, and decision-makers during the last century. This attention is associated with benefits of promoting walkability and creating walkable environment which ranges from physical and mental health to economic and environmental improvements.

First and foremost, walking has been seen as a key factor in successfully improving mental and physical health issues, such as cardiovascular disease, diabetes and obesity, reduced stress and mental alertness (Forsyth & Southworth, 2008). While many modern urban areas have been built around cars; pedestrian and pedestrian environment have been neglected (Cambra, 2012). According to the World Health Organization (Guthold et al., 2018) statistics between 2001 and 2016, more than one-third of the world’s population is inactive. Given that urban experts and public health specialists alert the necessity of promoting a pedestrian friendly environment.

Moreover, the American Planning Association has pointed out the positive effect of walkability on the economy. Indeed, creating more walkable places, promotes the presence of people on the street which increases the commercial performances. It

supports local business such as street shopping and tourism related activities (Cambra, 2012). Some other studies have indicated that a high walkability score of an area has a significant positive effect on housing prices (Boyle et al., 2014). In addition, walking – as a car free activity, is associated with less energy and resources consumption.

Besides that, walking is considered as a “green” and “sustainable” mode of transport because of its low environmental impact; reducing noise pollution, reducing traffic congestion, decreasing oil dependency and greenhouse gases’ emission (Park, 2008).

To summarize, encouraging urban people to walk more via designing better urban environments provides health benefits, economic development and environmental advantages, as mentioned above. However, “how urban design characteristics encourage people to walk?” and “how pedestrians’ environmental experience can be made more pleasurable?” are important questions that need to be answered. Given that, this study aims to focus on these questions.

2.3 Pedestrian’s Experience and Walkability

It’s on foot that you see people’s faces and that you meet and experience them. That is how public socializing and community enjoyment in daily life can most easily occur. And it’s on foot that one can be most intimately involved with the urban environment: with stores, houses, the natural environment, and with people. (Jacobs, 1993)

This quotation by Allan B. Jacobs, in his book *Great Streets* (Jacobs, 1993) illustrates the importance of walking, experiencing the urban setting “on foot” in people’s everyday lives. On foot experience of the urban environment let people to connect with their community. According to the Compact Oxford English Dictionary (2020), a pedestrian is “*a person walking in the street and not travelling in a vehicle*”, while a walker is “*a person who walks, usually for pleasure or exercise*”. Therefore, walking (Lo, 2009) is defined as a mode of transportation which involves various

vehicular modes such as driving, cycling, or taking a public transport. In addition, walking does not solely associate with transportation purposes, but it is also associated with other purposes such as exercise, recreation and social interaction.

Moreover, Jan Gehl (Gehl, 2010) in his book “Cities for people” adds that walking relates to socialization. Pedestrians walk, look back and at, cross the street, meet, talk, wait for someone or just stand, stop by a café or enter a shop, sit or lie down, run, dance. For example, and right now while you are reading this paragraph, probably in different cities around the world, a woman is walking straight to her work, children are playing in the playground, a man is having a walk around or buying some fruits, a family enjoying the sunset at the border of the sea, some friends talking at the corner of the street, or teenagers exercising outside. Indeed, *“a walk in city space is a forum” for the social activities that take place along the way as an integral part of pedestrian activities*” (Gehl, 2010, p.120). In cities, we live, walk, shop, meet, work, enjoy. A city is a place where to see and to be seen, hear a “Hello” and wave in return. Walking as a social activity, offers also many choices. We walk in a group or alone, sometimes talking, maybe holding hands. Walking, after all, is the best way to socialize.

Furthermore, walking played an important role in the philosophic and political process of many philosophers, from Kant and Rousseau, Baudelaire and Kierkegaard to Nietzsche and Thoreau. It was largely an elite and idiosyncratic activity. Solnit (Solnit, 2007) in her book “Wanderlust: A History of Walking” considers walking not only as an activity but also an instrument for reclaiming the world: it is the beginning of the citizenship. In fact, she relates the word citizen to cities, and this is why the *“ideal city”* should be conceived around citizenship - the presence of the citizens in the public urban life. Also, Frédéric Gros (Gros, 2019) in his book “Philosophy of Walking” (Marcher une philosophie), considers walking from one place to another - from a spiritual point of view – as a way of proving walker’s salvation. It’s through walking that you reconnect your soul to your body. Indeed, living in a contemporary society – and after a long day sitting at desk writing, driving cars and running from one place to another, walking is the best choice to recuperate.

In brief, people walk for various reasons including to reach somewhere, to exercise, to recreate or to socialize. What they expect from the city in terms of urban design qualities may differ by their purpose and to which extent their needs are met via urban design characteristics may influence their walking behavior (speed, interaction with the social and physical environment etc.). Given that, this study aims to understand how their behavior changes as the physical environmental characteristics alter. Due to this aim; understanding pedestrian behavior while walking is the main challenge of this study. This challenge will be answered in methodology part and how pedestrian behavior can be measured will be discussed in more details in part 3.1.

2.4 Empirical Studies on Walkability

Since 2000's, there have been several reviews in the travel-behavior and public-health literature of the relationship between the built environment and active travel or physical activity (Forsyth et al., 2007; Forsyth & Southworth, 2008; Lee & Moudon, 2006; Pikora et al., 2003; Saelens & Handy, 2008; Saelens et al., 2003; Talen & Koschinsky, 2013; Handy et al., 2002; Ewing & Handy, 2009) Although most of these studies are focused on North American cities, the findings provide a valuable and suitable framework for the study of other urban situations. Here the main studies of well recognized authors about the built environment and design qualities in relation to walkability will be presented.

Southworth (2005) in his paper "Designing the walkable city" presented six criteria for design of a successful pedestrian network:

- 1- Connectivity of path network, both locally and in the larger urban setting ...
- 2- Linkage with other modes: bus, streetcar, subway, train ...
- 3- Fine grained and varied land use patterns, especially for local serving uses
- 4- Safety, both from traffic and social crime ...
- 5- Quality of path, including width, paving, landscaping, signing and lighting and...

6- Path context, including street design, visual interest of the built environment, transparency, spatial definition, landscape, and overall exportability. (Southworth, 2005, p. 249).

“Connectivity” of a sidewalk in local or large urban settings refers to the presence and continuity of sidewalk and measured with the presence and absence of barriers such as “*the pattern of disconnected cul-de-sacs, dead-end streets, barrier arterials, and highway*”, path distance to various points, presence of various route choices and density of intersections or block lengths. “Linkage with other modes” refers to the presence of different means of transport. An area should be well connected inside but also accessible in terms of time and distance from and to the surroundings areas. “Fine grained and varied use patterns” refers to land use diversity and intensity of not only daily/ necessary needs such as shops, banks and elementary schools, but also recreational needs such as parks and recreational paths. “Safety” refers to pedestrians’ potential to encounter with a traffic accident or a social crime. “Quality of path” refers to street furniture that not only influence the comfort and safety of pedestrians in various ages and abilities to walk around, but also the pleasurability and imaginability of a street. “Path context” refers to the visual aspect of the visual environment, transparency on the street and visible activities, landscape elements and views. It is considered as the ultimate factor and most problematic criteria in walkability studies. It is the criteria that can encourage pedestrians to spend more time outside and enjoy the social life in public spaces.

Ewing & Handy (2009) in the paper titled “Measuring the unmeasurable: Urban design qualities related to walkability” provides operational definitions to establish a framework to measure the physical features of the street that may affect the walking behavior. These features are ranked from more objective to more subjective as; physical features, urban design qualities, and individual reactions. Yet, physical features individually may not capture people’s overall perceptions of the street environment or their walking experience. This study accordingly describes the perceptual qualities of the walking environment and tries to objectively measure seemingly subjective qualities of the walking environment (Ewing et al., 2009). The

conceptual framework (Figure 2.1) presents the relationship objective and subjective measures of physical environmental characteristics and walking behavior.

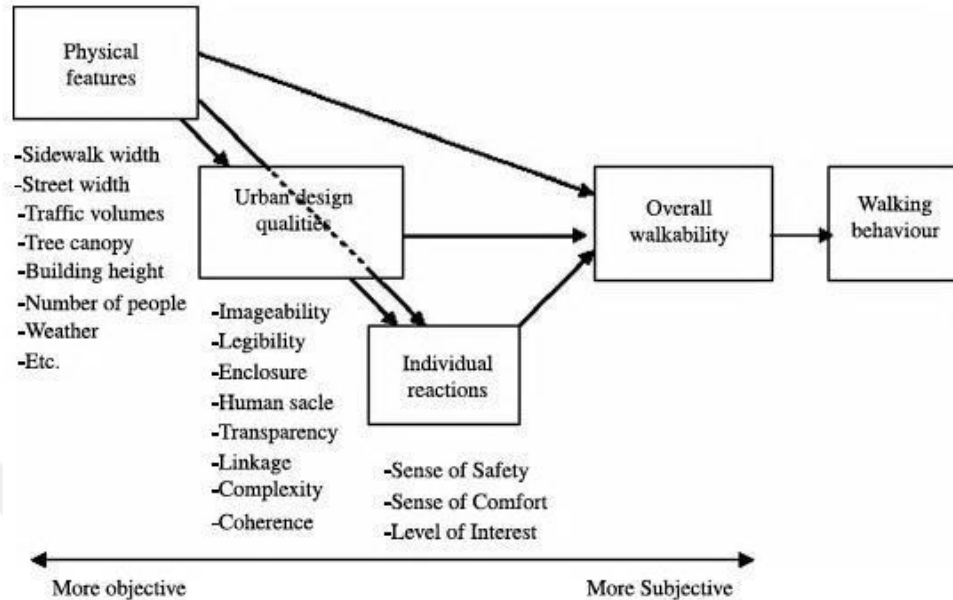


Figure 2. 1 Conceptual framework of walking behavior (Ewing & Handy, 2009)

Ewing and Susan described five urban design qualities (imageability, enclosure human scale, transparency and complexity) that may affect people's decision to walk or not as follows and describe the objective measures of each urban design qualities as in table 2.1 (Ewing & Susan, 2009, p. 72)

- Imageability is the quality of a place that makes it distinct, recognizable and memorable. A place has high imageability when specific physical elements and their arrangement capture attention, evoke feelings and create a lasting impression ...
- Enclosure refers to the degree to which streets and other public spaces are visually defined by buildings, walls, trees and other vertical elements. Spaces where the height of vertical elements is proportionally related to the width of the space between them have a room-like quality ...
- Human scale refers to a size, texture, and articulation of physical elements that match the size and proportions of humans and, equally important, correspond to

the speed at which humans walk. Building details, pavement texture, street trees, and street furniture are all physical elements contributing to human scale ...

- Transparency refers to the degree to which people can see or perceive what lies beyond the edge of a street and, more specifically, the degree to which people can see or perceive human activity beyond the edge of a street. Physical elements that influence transparency include walls, windows, doors, fences, landscaping and openings into mid-block spaces ...
- Complexity refers to the visual richness of a place. The complexity of a place depends on the variety of the physical environment, specifically the numbers and types of buildings, architectural diversity and ornamentation, landscape elements, street furniture, signage and human activity (Ewing & Handy, 2009, p.71-79).

Table 2.1 Streetscape features related to urban design qualities – walkability (Ewing & Susan, 2009, p. 72)

Urban Design Quality	Significant physical features
Imageability	people (#) proportion of historic buildings courtyards/plazas/parks (#) outdoor dining (y/n) buildings with non-rectangular silhouettes (#) noise level (rating) major landscape features (#) buildings with identifiers (#)
Enclosure	proportion street wall—same side proportion street wall—opposite side proportion sky across long sight lines (#) proportion sky ahead
Human scale	long sight lines (#) all street furniture and other street items (#) proportion first floor with windows building height—same side small planters (#) urban designer (y/n)

Table 2.1 continues

Transparency	proportion first floor with windows proportion active uses proportion street wall—same side
Complexity	people (#) buildings (#) dominant building colours (#) accent colours (#) outdoor dining (y/n) public art (#)

Another research in transportation, urban design, and planning field leaded by Saelens et al. (2003) in the paper “Environmental correlates of walking and cycling: Findings from the transportation, urban design, and planning literatures” (Saelens et al., 2003) studied the relation between physical environmental variables and individuals’ walking and cycling for transport behavior. The study compared different neighborhoods to understand the correlation between transport choices and built environment variables (Saelens et al., 2003). The variables are based on community design and land use variables and according to the glossary of transportation and planning terms relevant to walking and cycling for transport including: city planning, geographical information system (GIS), new urbanism, smart growth and urban design, and connectivity, employment density, land use mix, proximity and residential density (Saelens et al., 2003). The definition of each variable is presented below:

Connectivity: The directness or ease of travel between two points that is directly related to the characteristics of street design ...

Employment density: The number of employees or jobs per unit of land area ...

Land use mix: The level of integration within a given area of different types of uses for physical space, including residential, office, retail/commercial, and public space. Land use is controlled by zoning ordinances that reflect political decisions most often made at the local level ...

Proximity: The straight-line distance between different land uses such as residential, office, retail, and commercial activities ...

Residential density: The number of residential dwelling units per unit of land area (Saelens et al., 2003, p. 81).

Similarly, many audit tools/ instruments for measuring the quality of the walking environment have emerged (Day et al., 2006; Pikora et al, 2002). They are widely used across the US by researchers, local governments, and community groups. They attempted to measure physical features of the built environment.

For example, The Irvine-Minnesota Inventory, developed by Day et al. in the paper “The Irvine-Minnesota inventory to measure the built environments development” (Day et al., 2006) and affiliated to the University of California and the University of Minnesota, is an audit tool that attempt to measure the built environment features used by pedestrians and bicyclists linked to walking. The audit tool is an observational audit and applicable for residential and commercial areas. 162 items were defined to measure and they are grouped in four main chapters: accessibility, pleasurability, perceived safety from traffic and perceived crime safety. It is important to note that some items were previously used in SPACES audit tool developed by Pikora et al (2002).

In brief; previous studies showed that the extent to which an environment supports walking behavior is measured by various objective and subjective measures including land use variety, physical environment variety, visual aspect of the visual environment, quality of path, connectivity, proximity and safety. This study aims to focus on the most pronounced factors; public transportation connectivity, variety of destinations, variety of the physical environment, sidewalk and pedestrian area, pedestrian comfort and use of parks.

2.5 Case Context

As discussed in the preceding sections, walkability is an important concept in sustainable urban design. Until today, the concept of walkability was widely studied in North American, Australian and European contexts. However, only few were

conducted in the Turkish context. Turkish cities differ greatly from North American, Australian and European context not only by the urban form, but also by the culture and the environment, which have strong influence on the society's life style and people's walking behavior. Given that, finding of North American, Australian and European contexts may not have applied value for Turkish context and it is important to get a better understanding of pedestrian behavior in various Turkish settings. Given that; Izmir is selected as the case area in this study.

Izmir, the third largest city on the west coast of Turkey, is a growing centre for research and practice in urban sustainability and aims to be the most walkable, bikeable and livable city in Turkey by 2023 (according to the 2014-2023 Izmir regional plan). Like many cities around the world, Izmir is facing problems caused by a growing population, air pollution and uncontrolled urbanization, hence the need of a new sustainable urban development strategies received growing attention. The city has already promoted sustainable urban mobility through developing pedestrianization projects such as making more car free roads and urban centres and promoting sustainable transport options - safe bike lanes, bike-sharing systems and integrating public transport systems.

In Izmir, there are 30 districts. The strategy of the city is to pedestrianize the city center and connect it to others transport systems like public buses, ferry and rails. This study selected Karsiyaka as a case study area. Karsiyaka is relatively well recognized for its work on promoting walkability in the area. The district involves all types of land uses and various types of residential areas (historical value, contemporary value, seaside apartment, residences, slums, etc). It is a compact urban area with smooth topography and a relatively temperate climate makes it easy to move around via walking or cycling.

In brief, in order to understand the relation between physical environmental characteristics and pedestrian (or walker) experience an empirical study was conducted in Karsiyaka district. Two neighborhoods were selected in the district, which differs in planning strategies for pedestrians; one represents the old city center

and the other represents the new development are in the district. In both areas, the pedestrian experience and the environmental characteristics were investigated and compared. Next section, Chapter 3, will discuss the methodology used to measure the pedestrian behaviour and experience in this case study.



CHAPTER 3

RESEARCH METHODOLOGY

"If you want to understand people in real life, you have to study them in their context and in the way they operate." (Gillham, 2000, p. 11)

Gillham (2000)

This chapter starts with an overview on the existing studies and approaches about measuring the pedestrian experience while walking. Secondly, two pilot studies will be presented in which the pedestrian experience were investigated. The first one leads to an understanding of the methodology about how to specify the initial point of observation, how to trace participant's paths and for how long etc. The second pilot study leads to an explanation of who, how, where and when the observations would be done. Ten pedestrians were followed during a ten minutes walking trip and data on the origin/ destination points, walking distance, route choice, the purpose of walking, speed, gender, attitudes and other details were collected. With lessons learned from these two pilot studies, a final model was developed with a detailed description of how the study will be conducted on site and how the results will be documented. A part of this chapter was presented in a conference and published (Mensi & Cubukcu, 2019).

3.1 Literature Review (Previous Studies on Measuring Pedestrian Behavior)

The aim of this part is to get an insight into pedestrians' walking behavior and to understand the different approaches to measure the walk trip. In order to develop a methodology based on other studies which investigate the pedestrian experience, different approaches measuring the walk trip would be investigated. Empirical studies aim to understand the pedestrian experience via various types of methods, some studies have used classic methods (travel diaries and surveys), others used GPS tracking methods or on-site observations.

For many years, most studies opted for classic methods - surveys or diaries- with pedestrians or residents. For example, both Hartenstein and Iblher (1967) and

Marchand (1974) used surveys to collect detailed data on individual route choices. Blivice (1974) collected data on pedestrian route choices via surveys. Surveys or diaries are simple and effective in data collection and data assessment. However, it has been considered too limited to measure the pedestrian behavior. People forget to mention all visited locations, behavior changes and issues associated to privacy (Elgethun et al. 2007). Also, findings can be manipulated by the researcher's expectation of acquired information (Creswell, 2008; Yin, 2008). It is also, time-consuming, expensive and require significant effort (Shoval et al. 2014).

By contrast, some other studies relied on expert panel surveys or publicly available secondary data. Several walkability audits tools (Walk Score; Day et al. 2006; Pikora et al. 2002; Pikora et al. 2003; Cerin et al., 2006; Clifton et al. 2007) have been developed to evaluate the walkability of a site or street segment. It measures the built environment attributes associated with walking. However, for example, Walk Score has been criticized for ignoring some relevant parameters (Cubukcu et al., 2015; Hall & Yam, 2018). Moreover, while, walkability indices were considered as useful tools to evaluate the walkability, it does not consider the pedestrian's evaluations such as subjective measures of walkability that influence the walking behavior (Guhathakurta et al., 2013). In other words, these walkability audit tools measure the extent to which a site or a street segment encourages (or discourages) walking but they fail to measure pedestrian behavior or where they tend to walk or not.

In the last years, a growing body of literature have used global positioning system data (GPS) to understand where the pedestrians walk. Such method has been used for various purpose. For example, Wolf et al. (2001), Shoval & Isaacson. (2006) and Cho et al. (2011) used GPS and developed algorithms to study travel behavior. While others used GPS tracking method to examine travel behavior of tourists (Asakura & Iryo 2007), children and adolescents (Duncan & Mummery 2007; Wiehe et al. 2008), and retail consumers in shopping malls (Moiseeva & Timmermans 2010). The GPS tracking device can be set on a wearable belt or enabled smart phones. It collects a high spatio-temporal resolution of the pedestrian movement's data. However, it only provides information about the paths taken in each travel log, but no information on

pedestrian travelling behavior and experience. Besides, participants (pedestrians) are aware that their travelling information is being recorded so the research purposes may affect their walking behavior (Winters et al. 2008). One more thing to add is that GPS tracking method has also been regarded as sophisticated and costly method (Paz-Soldan et al. 2014; Shoval et al. 2014).

Considering the advantages and limitations of GPS and surveys methods, some studies attempt to use both GPS tracking and survey methods simultaneously to understand the environmental experience during the walk trip and to track the pedestrian movements over a certain period of time. This provides a high level of accuracy in the acquired data (Moiseeva & Timmermans, 2010). Yet, the use of this combined methodology is costly. Moreover, participants may be reluctant to be involved in such studies because they require too much work from them.

Alternatively, technologically sophisticated observation methods are also used. Lautso & Murole (1974) and Pushkarev and Zupan (1975) used aerial photography to estimate pedestrian volumes on streets but failed to draw the walked routes taken by pedestrians. Sisiopiku & Akin (2003) observed pedestrian activities through video cameras. Hess et al. (1999), Suminski et al. (2006), and Alfonzo et al. (2008) counted the number of people walking to study pedestrian volume and route choice. While this method provides information on the pedestrian density in the street and their walked routes, it fails to collect data about the purpose of walking and the pedestrian attitude while walking.

Some other studies attempted to understand pedestrian's walking experience via on-site observations. Observation method was first used to study visitors' experience to world's fair by Weiss & Boutourline (1962). They proposed that an obtrusive observer does not affect the behavior of the subject (pedestrian). This method was used mainly in the urban planning and transportation-walkability related fields. While Choi (2012) observed residents' walking trips in residential areas, Zacharias & Zhao. (2018) and Kim (2015) observed pedestrians' walking trips at metro Station, Hill (1984) follows a pedestrian on foot to track her/his route through a public urban area. On-site

observations have a considerable validity where information on pedestrian experience are collected by directly following the pedestrian on foot, however findings can be manipulated by the observer's expectation and intention. It is also time consuming and requires physical effort of the observer. Contrary to survey methods, the socio-demographic characteristics of the pedestrian can not be collected precisely. Yet, it is the only way to record pedestrian's actual travel behavior, descriptive information about their activities and experience. On site observation has many strengths: it is unobtrusive and perform in exploring subjects' bias-free behaviors (Pushkarev & Zupan, 1975). Applying the on-site observation method could effectively overcome the shortcomings of the survey and GPS tracking methods.

This thesis, accordingly, aims to develop an unobtrusive observation method to track pedestrian's paths and to understand their experience during this walk. Yet, there is no clear methodology that discussed how to systematically measure the pedestrian behavior. Consequently, there is a need to develop a methodology for determining how to do the observation and get information about the pedestrian behavior.

3.2 Research Method (Pilot Studies)

Inspired from the previous studies and in order to set the procedure to track people's walking behavior, two pilot studies were conducted in Sirinyer, Buca / Izmir. Previous studies will be studied to understand how to collect data on various parameters and define the origin, destination and observation period. The pilot studies aim to set the parameters to be collected, optimum period of observation and how the observation should be done.

3.2.1 Pilot Study 1

The purpose of the first pilot study, was to get an understanding of the following questions:

- Where should be the initial point of observation?
- How to record the pedestrian behavior and paths?

- For how long the observation would be done?

Photographing or filming was avoided during the observation in order not to offend the observed pedestrian.

The literature offered the initial point of observation to be a public transport stop, residential building or commercial building. The case study area represents a mixed-use neighbourhood which involves residential and commercial buildings and various modes of public transportation modes with moderate, low and high population density. Given that, the first person encountered in these areas in the selected neighbourhood (Sirinyer) was tracked. This is repeated for four pedestrians. The origin and destination of each walk trips were as follows:

- 1- From Metro station to Bus Station
- 2- From Bus Station to another Bus Station
- 3- From a Barber to Apartment Building (Home address)
- 4- From Apartment Building (Home address) to a grocery shop to Apartment Building.

The routes walked were collected and recorded using the application “My Tracks”. The application is connected to GPS. The notes on the observed walking behavior (details about the speed, dress code, estimated age, gender, duration, looking at something, interaction with the built environment and pedestrian density, walk alone or with others etc ...) were noted during the observation.

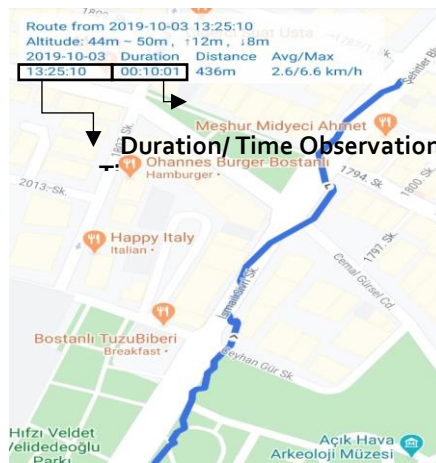


Figure 3. 1 Recorded walking path of tracked pedestrian

As Figure 3.1 shows, via this application it is possible to record the walking path of tracked pedestrian and gather data about starting time and duration of the trip. In addition, based on that information, the distance travelled and mean speed of the walk can be calculated by using geographic information system analyses.

Table 3.1 Pilot 1(Friday, 01 March 2019): walk trip and pedestrian behavior

Id	Time	Time spent	Distance	Gender	Estimated age
01	10:43:37	02min 55sec	196 m	Female	20-25 years old
Wearing casual clothes and high heels, she was walking most of the time on the sidewalk. The street wasn't crowded. She was looking at boutique and photography studio (stopped for some seconds) and continued to the bus station.					
02	10:47:26	04 min 46 sec	179 m	Female	50 - 65 years old
Walking so slowly, she was looking at shops (tea). While walking she received a call (maintained same speed).					
03	10:58:42	12 Min 09 Sec	664 M	Male	> 60 Years Old
Holding a plastic bag. Walking in a moderate speed, stopped by a journal place, bought one and continued his path. He was giving priority for pedestrian coming from opposite side and for cars at crossing point. He looked left/ right while crossing. He stopped by a bakery and went to the bank but it was crowded so he did not spend too much time inside and he got out and reached to his final destination (residential building).					
04	11:25:52	07 Min 13 Sec	223 M	Male	20-30 Years Old
He was wearing casual clothes. He seems that he knows the place. Moderate speed.					



Figure 3.2 Pilot 1(Friday, 01 March 2019): Walk trip and route choice

Observation of four people (Figure 3.2) showed that the pedestrian did not notice the observer, it was easy to record various information about the pedestrian and his/her experience such as the dress code, estimated age, gender, speed, time spent, looking at something, interaction with the built environment and presence of other pedestrians, walking alone or in group. Such information was collected for each individual separately but it was not coded systematically. Given that the information was not comparable across pedestrians. This shortcoming will be acknowledged in the next pilot study. Moreover, the duration differed significantly (from 2 to 12 minutes) and

pedestrians stop by various destinations for a short period of time along the path. This first pilot study produced new questions:

- What should be the start point of observation? What time should the observation be done?
- What should be minimum duration of trip? When should a stop be considered as final destination (for how long the observer should wait for the participant to get out)?

3.2.2 Pilot Study 2

As the first pilot study uncovers various questions to be answered, previous studies were reviewed to understand for who, how, where and when the observations would be done (Table 3.2).

Table 3.2 Comparing studies on on-site observation

Paper	Choi (2012)	Kim (2015)	Hill (1984)	Zacharias et al. (2018)
Area of study	Residential area	Mixed use area	Not residential area	Mixed use area
Observation point	Home address	Station exit / Park	N/A*	Metro stations
Destination/ time spent	Home most of the time/ no time restriction	Entering a residence, a café and sit down, waiting 20 minutes	Pedestrian remains in the location for a period of 10 minutes	Entering a first destination
Period	From 7:00 am to 8:00 pm	From 2:00 pm to 6:00 pm	N/A*	10:00 am, 12:30 pm and 7:00 pm
Excluded walkers	Elderly persons and children	Those who are under 18 years old and who transferred to another travel mode	Those who appeared to have a regular route to follow as part of a job	N/A*

N/A* Not available

First, the table revealed that most of studies observe pedestrians in a mixed-use area and avoid waiting pedestrians to go out from their houses. Secondly, time restriction varied between entering a first destination or waiting the subject for a restricted time to go out. Finally, observations were done at peak hours when the streets are crowded.

Given that literature, the following rules were set for the second pilot study:

- Study a mixed-use area (presence of public transit, residential and commercial buildings), and avoid residential areas. Because, waiting people to go out from their houses is time consuming,
- Initial observation points should be the road intersections; major roads intersection in high density area and secondary roads intersection in low density area,
- The trip is considered to be completed if pedestrian enters a house or a café and do not come back for 2 minutes, otherwise observe for at least 10 minutes
- The observation should be done in peak hours to capture as much pedestrian as possible,
- Exclude people who follow a regular route as part of their job (policeman, cargo deliver ...),
- Record data about: route, gender (male, female), estimated age (child, young, adult, elderly), time spent, distance, purpose of walking activity (transport, recreation or exercise), speed (slow, moderate, speed), interaction with environment, crossing attitude, weather conditions, difficulties and sidewalk conditions are collected.

Three initial observation points were specified:

- Intersection of main roads: Intersection of Menderes street and 302 street,
- Intersection of main roads: Intersection of Menderes street and 366 street,
- Intersection of two secondary roads: Intersection of 336 street and 317 street.

Ten pedestrians (Figure 3.3) were randomly selected (the fifth person passing by an observation point) and observed for 10 min (if nonstop, about 1km = 1000 meters walking distance).

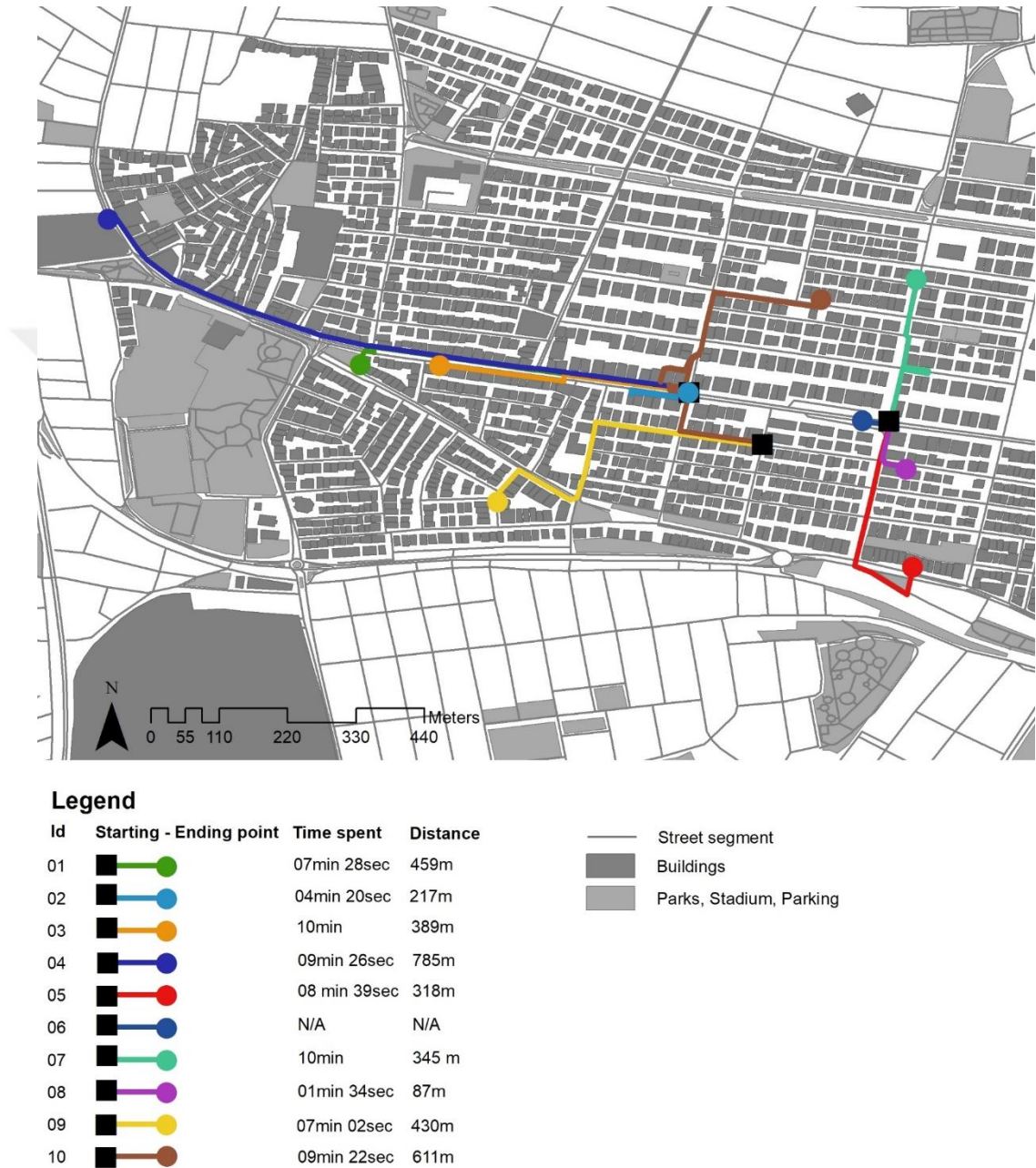


Figure 3.3 Pilot 2 (Thursday, 07 March 2019): Walk trip and route choice.

Table 3.3 Pilot 2(Thursday, 07 March 2019): walk trip and pedestrian behavior

Id	Time	Gender	Estimated age	Distance	Time spent	Purpose
01	13:14:57	Male	Adult	459m	07 min 28sec	Recreation
Moderate speed. Holding in one hand his coat and a plastic bag and his phone in the other. He checked his phone 3 times, he almost stopped. He was giving priority to other pedestrians.						
02	13:28:34	Female	Young	217 m	04 min 20 sec	Transport
Wearing high heels. Crossed the street, bought something from a small shop (stayed for 45 secs). While crossing, she was almost running, didn't wait for the bus, and crossed the street once again running to catch the bus.						
03	13:34:59	Female	Young	389m	10 min	Recreation
(group of 2)						
They are carrying two small bags/ back bags. Entered a boutique for 3mins. Crossed the street. They didn't use the crossing signs, they run, it was dangerous but they managed to cross. I think they recognized me, they stopped by a shop.						
04	13:52:30	Male	Elderly	785m	09min 26sec	Transport
He was almost running, no stop. Sometimes he looks at his right (presence of shops). He entered a bank before the 10min and did not get out.						
05	14:21:16	Female	Adult	318 m	08min 39sec	Recreation
(group of 2)						
They were talking to each other and walking in a high speed on the street (not the side walk) at the beginning for a long time then one of them stepped on the sidewalk and the other followed her. Entered a Boutique (Tuhafiye) and spent one minute. They went out and crossed the street, checked the flowers outside the market and entered the market.						
06	N/A*	Male	Adult	N/A*	N/A*	N/A*
I couldn't record any information on my application. The trip was less than 1 min.						
07	14:38:44	Female	Adult	345 m	10 min	
She was walking so slowly, looking at boutiques. She stopped in the middle of the street, made a phone call. She noticed a street vendor, changed her direction got and got some snacks then returned back to the main street. Walking, eating and window shopping. She crossed the street (probably for shadow). She stopped; as if she was waiting for someone.						
08	14:56:54	Female	Young	87 m	01 min 34sec	Transport
She was walking in a moderate speed, crossed the street (waited for the light) entered a tailor store, spent the remaining time inside the store.						
09	15:18:05	Female	Adult	430 m	07 min 02sec	Transport
Moderate speed. She was pushing a stroller and carrying a shopping bag. She was walking on the street and didn't use the sidewalk. She reached a residential building before the 10 min.						

Table 3.3 continues

10	15:30:17	Male	Adult	611 m	09min 22sec	Transport
He had a paper and a lot of keys on his hand. He crossed the street (green light), stopped by a pharmacy for a short period of time and continued walking. First, he used the sidewalk then walked on the street, at a certain moment he stopped and he was looking for something, she come back to a building behind the pharmacy, checked the door and he returned and continued walking, he was almost running. He entered an apartment building.						
N/A* Not available						

Observations of ten people (Table 3.3) showed that the pedestrian did not notice the observer, except one participant (coded as 3). While in the first pilot study, information wasn't coded systematically. In this the second pilot study, a structured form was used to collect data on gender, estimated age and walking purposes. However, it was acknowledged that such a structured form should be created to collect data about pedestrian's behavior. In addition, in this pilot study, it was noted that about 20% of participants stopped along the path. Some even stop after 1 or two minutes. This experience showed the need to drop the participants who were observed less than 5 minutes from the sample. This experience also showed that in order to get a useful data for 1 person about 4 observations should be completed. That way the sample size of the original data is set to be 120. With the constraint that the observations should be done in similar weather conditions, the observations should be completed in 5 days (weekdays). In other words, the above-mentioned time limitations determined the sample size. This pilot study led to a developed frame of data collection method.

3.2.3 The Data Collection Method

The main purpose of this thesis is to study the pedestrian experience and to develop a guide on the methodology of how the on-site observations should be conducted and what kind of data should be collected systematically as an indicator of pedestrian experience. Given that descriptive information about pedestrian activities and behavior was collected in order to understand the pedestrian experience. The proposed method would require time and physical effort to collect data. Moreover, some of the pedestrians who are followed for some time should be dropped from the sample as

they stop by at several locations and spend most of their observation period in indoors and fail to walk for full 10 minutes. In other words, these pilot studies showed that in order to observe a pedestrian behavior, a 10-minute walk behavior should be observed.

For observing pedestrian paths and behavior, two pilot study experience leads to following conclusions for the upcoming comprehensive study:

1. The weather conditions should be stable during the observation. Sunny days with a temperature between 20° C and 30° C are preferable.
2. The on-site observation could be conducted during weekdays from 10:00 am to 18:00 pm in order to capture as much pedestrians as possible.
3. The intersection of the major roads and secondary roads might constitute the initial observation points.
4. Walk trip and route choices could be recorded using “My tracks” application.
5. A randomly selected pedestrian could be followed (the fifth person passing by an observation point).
6. For the duration of observation following protocol could be used:

A: If he/ she entered indoors and walked less than 5 minutes, wait 5 minutes

- a. If he/ she doesn't come back, drop him/ her from the sample.
- b. If he/ she comes back, observe him/ her for the remaining time (10 minutes).

B: If he/ she walked more than 5 minutes, wait him/ her for the remaining time (10 minutes):

- a. If he/ she comes back observe him/ her for the remaining time.
- b. If he/ she doesn't come back, start observing next pedestrian.

7. Information on time, distance, origin, destination and stops and barriers, crossings should be recorded. The other information related to the pleasure and difficulties in walking through and crossing the street and interaction with the built environment and with other people can be noted and short notes could be

taken when it's possible. This field data could be analyzed via Geographic Information Systems.

Data on pedestrian and her/his behavior should involve the following information:

- Demographic and personal characteristics:
 - Id: a number for each pedestrian.
 - Gender: Specify the gender of the pedestrian (male, female);
 - Estimated age: child, young, adult, elderly:

Where, and from the observer 'perspective a child is between 0 and 15 years old, young are between 15 and 30 years old, adult is between 30 and 65 years old and elderly is over 65 years old.

- Group: specify if the subject is walking alone or in group.
- Dress code: causal, sport, chic ...,
- Speed of walk: Slow, Moderate, High.

Where, and from the observer's perspective slow is walking slowly, moderate is a normal speed, high is more than the moderate speed and almost running.

- Pedestrian behavior:
 - Walking purposes:

In the literature, various methods of classifying walking purpose are discussed. Some studies (Kang et al. 2013; Tudor-Locke et al., 2006) classified walking activities as utilitarian (functional/ necessary) or recreational (leisure/ optional). Utilitarian activity refers to walking in order to reach a destination, whereas recreational activity refers to physical activity that is performed during exercise, recreation, or any additional time other than that associated with one's regular job duties, occupation, or transportation (U.S. Department of Health and Human Services, 1996). At the same time other literature classified walking based on pedestrian purpose: transport, recreation and exercise (Saelens, 2005). Walking is a complicated behavior as walkers may have engaged in different walking activities during his/her walk trip. In this case,

some indicators can help identifying the purpose of each walk trip. For example, if pedestrian is wearing a business suit, dress coding can refer to walking for transportation. Moreover, higher speeds during walk can refer to walking for transportation. If pedestrian is walking in a group, it can be assumed that he/she is walking for recreation.

Table 3.4 Indicators to define the walking purposes

	Utilitarian/ recreational walking purposes	Walking for transportation/ recreation/ exercise
	Based on destination	Based on walking behavior
Destination	X	
Groups		X
Dress code		X
Speed of walk		X

The former classification (**utilitarian/ recreational walking purposes**) requires researcher to observe a full walking trip (from first origin to last destination) and the latter one (**walking for transportation/ recreation/ exercise**) relies on indicators of walking purposes which are not easy to code. In this thesis information on such indicators (group, dress code, speed) were collected as well as the 10-minute walk trip is coded as utilitarian / recreational based on the destination observed in ten minutes. Given that, since a part of walk trip was observed, findings on walking purpose from on-site observations should be evaluated cautiously.

In this study, purpose of walk is classified as utilitarian (or necessary) if the pedestrian stops by a work place, school, services, shopping, public transport or home and it was classified as recreational (or optional) activities if the pedestrian stops by a park, café, restaurant, a show or a gym. In addition, notes on walking behavior was taken on the following issues: interaction with the built environment, crossing attitude, pleasure and difficulties during the walk, socialization with others (talking with pedestrians, shopkeepers), meeting and greeting and walking the dog.

It is also important to note that:

- Photographing or filming should be avoided during the observation in order not to offend the observed pedestrian,
- Those who follow a regular route as part of a job (policeman, cargo deliver ...) should be excluded from the study,
- The pedestrian who noticed that his/ her walk trip is observed, should be dropped from the sample,
- Collected information should be anonymous and any disclosure of such information does not place them at any risk or damage their reputation.

3.3 Case Study

The empirical study was conducted in the district of Karsiyaka in Izmir city as it represents the general layout of the other neighbourhoods in Izmir and in Turkey. As explained in chapter 1, observations were held in two neighbourhoods. Observations held in Karsiyaka neighbourhood are coded as “zone K” and observations held in Bostanli neighbourhood are coded as “zone B”.

Zone K is a mixed-use area in the historical centre of the Karsiyaka Municipality. A main core of the area is Karsiyaka Bazar and is surrounded by a residential area. The centre is pedestrianized and the main street/road connect the ferry boat station (those coming from others municipalities) and tram station (those coming from other neighbourhoods in Karsiyaka municipality) to the Izban station (from the municipality and outside) and Turkish Taxi dolmus station (shared taxi). Kemal Pasa street is a wide and mainly commercial street: from clothing to restaurants, banks and phone services to food market.

Zone B is a mixed-use area surrounded by a residential area, too. People come to meet, eat and drink. Two streets are pedestrianized (Street Sehit Cengiz Topel and Balikci Park street). The neighbourhood has multiple gardens and parks along and inside the zone. Residential buildings are surrounded by gardens and green areas. The neighbourhood is well connected. While the ferry boat, Izban and buses play a major

role in connecting the neighbourhood to other parts of the city, the tramway improves the accessibility within the neighbourhood.

3.3.1 Observation Point/ Origin Point

Origin points are selected based on three variables: type of road intersection, public transportation connectivity and destination variety.

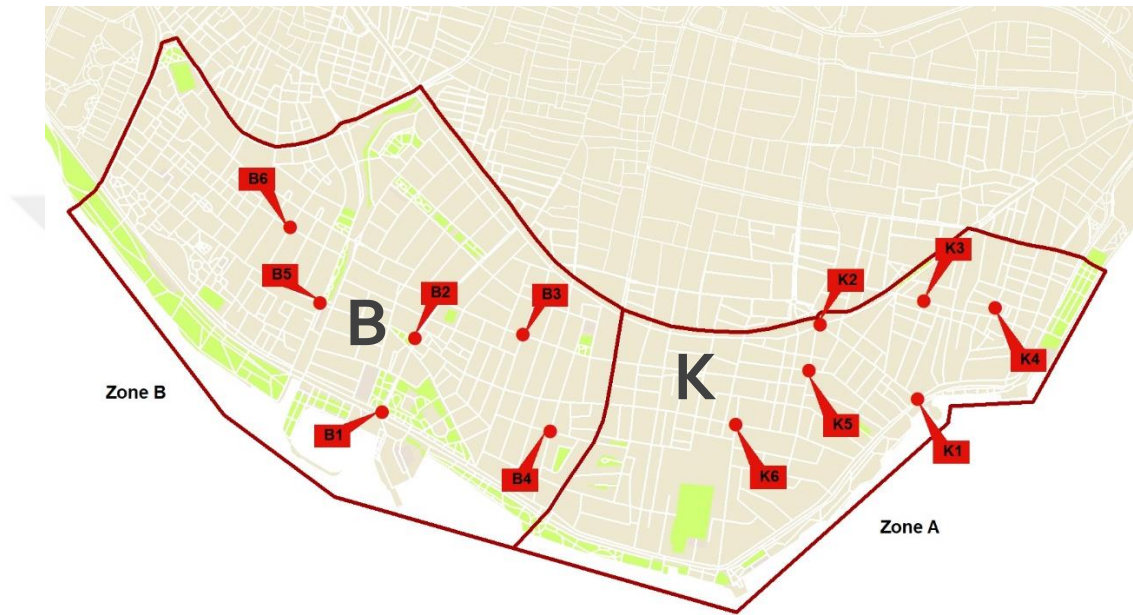


Figure 3.4 Study area and observation points.

Figure 3.4 shows the borders of the case study areas and the origin of the observation points. In zone K, 6 observation points were selected: K1, K2, K3, K4, K5 and K6. In zone B, 6 observation points were selected: B1, B2, B3, B4, B5 and B6.

3.3.2 Road Intersection (RI)

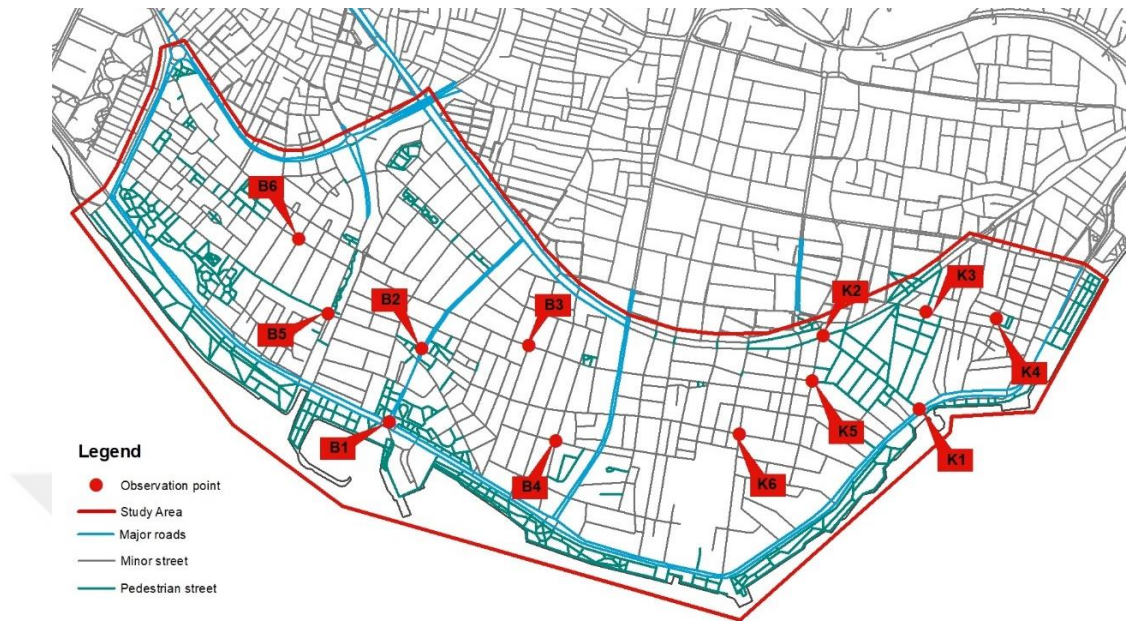


Figure 3.5 Variable road intersection (RI): Major, minor and pedestrianized roads in study area.

Figure 3.5 shows the context of origin points in relation to being close major, minor and pedestrianized streets. Based on the type intersection of roads, the selected observation points were classified into 5 groups:

- Intersection of two pedestrianized roads;
- Intersection of minor road and pedestrianized road;
- Intersection of two minor roads;
- Intersection of two major roads;
- Intersection of pedestrianized road and major road.

In zone K, 2 origins were on pedestrianized road intersection (K1 and K2), 2 origins were on minor road intersection (K4 and K6) and 2 origins were on the intersection of minor and pedestrianized roads (K3 and K5). In zone B, one origin was on major road intersection (B1), one origin was on the intersection of major and pedestrianized road intersection (B2), 3 origins were on a minor road intersection (B3, B4 and B6) and one origin was on the intersection of minor and pedestrianized roads (B5).

3.3.3 Public Transportation Connectivity (TC)

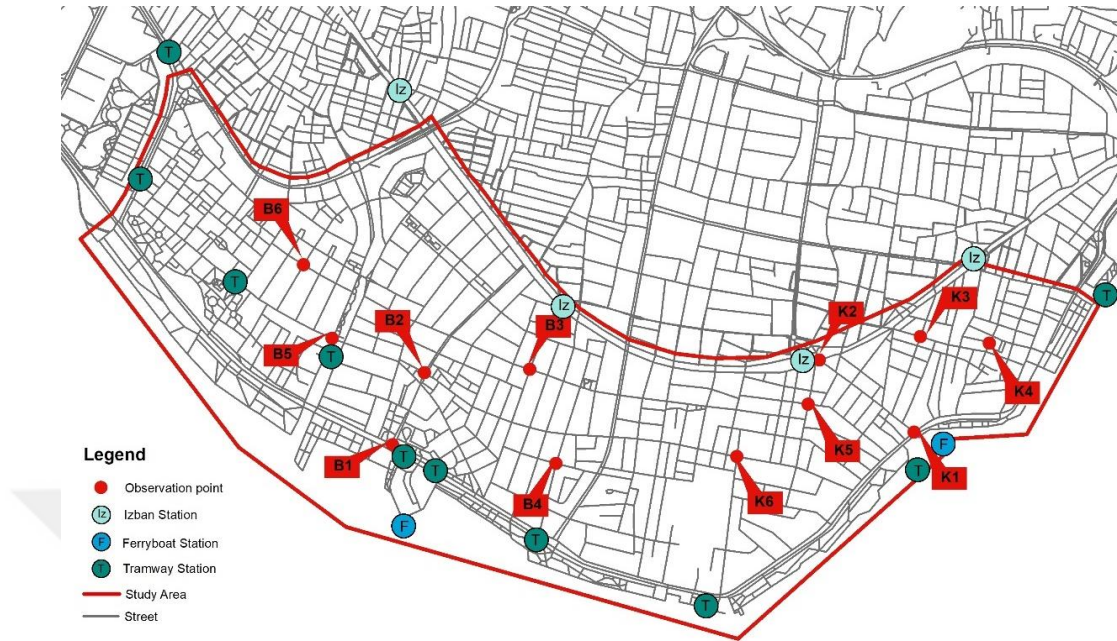


Figure 3.6 Variable public transportation connectivity (TC): Izban Metro station, Ferry boat station and Tramway station.

Based on the accessibility and presence of public transport (Ferry boat, Izban Mero and tramway), the selected origins were classified into 3 groups:

- High: At least one public transportation stop is visible from the selected origin,
- Moderate: At least one public transportation stop is reachable in less than 3 minutes' walk (250 meters) from the selected origin or in less than 3 minutes' walk (250 meters) it would become visible in the viewer's perspective;
- Low: Any type of public transportation stop is far from the selected origin or it would take more than 5 minutes walk to become visible in the viewer's perspective.

In zone K, 2 origins were classified as “high TC” (K1 and K2), 2 origins were classified as “moderate TC” (K3 and K5), and 2 origins were classified as “low TC” (K4 and K6). In zone B, 2 were classified as “high TC” (B1 and B5), and 4 origins were classified as “moderate TC” (B2, B3, B4 and B6).

3.3.4 Destination Variety (DV)

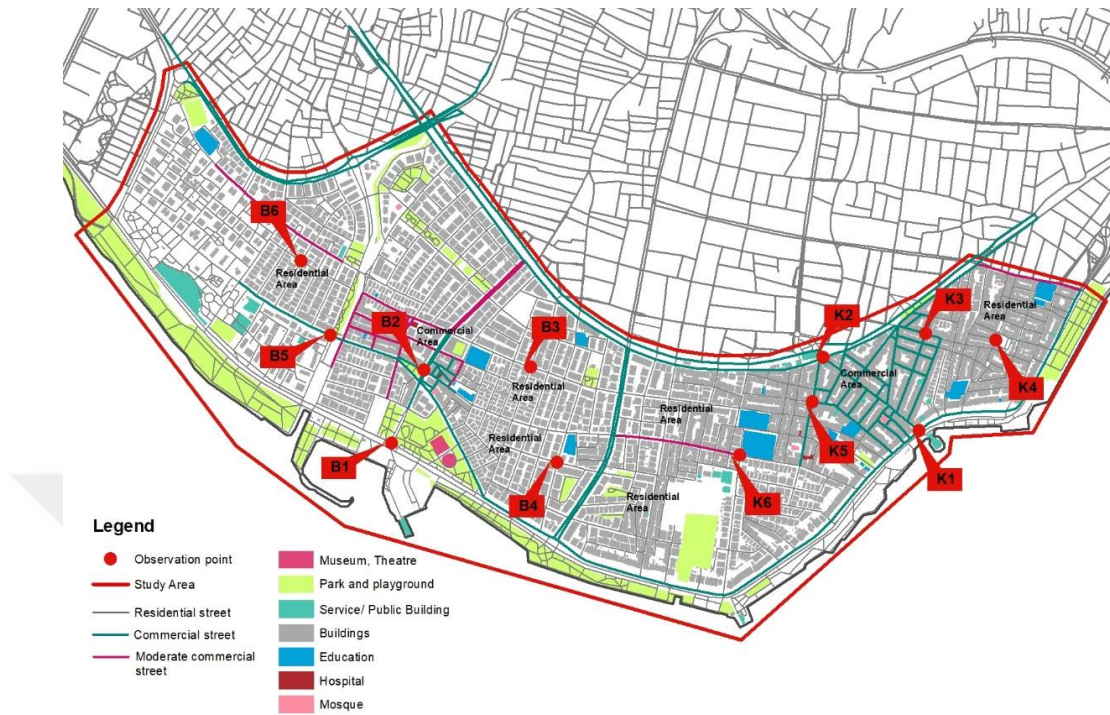


Figure 3.7 Variable destination variety (DV): commercial areas and residential areas

Based on the land use variety (commerce, service, public building, hospital, education, parks, ...), the selected origins were classified into 3 groups:

- High: Commercial buildings and non-residential buildings are present and visible from the selected origin and/present in closed vicinity of the selected origin;
- Moderate: Commercial shops and service buildings are present at ground floor level;
- Low: Convenience shops are present in residential area.

In zone K, 2 origins are on high destination variety intersection point (K1 and K2), 3 origins are on moderate destination variety intersection point (K3, K5 and K6) and one origin is on low destination variety intersection point (K4). In zone B, 2 origins are on high destination variety (B2 and B5) and 4 origins are on low destination variety intersection point (B1, B3, B4 and B6).

3.3.5 Observation and Data Collection

Given that, next section will summarize the important properties of each selected origin of observation points (Table 3.5 and Figure 3.8):

3.3.5.1 K1: Zone K

RI: Intersection of pedestrianized roads RI1 (Kemal Pasa Street and Cemal Gursel Street). In order to decrease the number of dropped pedestrians, only pedestrians who crossed the road and coming from the ferryboat, left and right side of the intersection are observed. While Kemal Pasa Street is pedestrianized street, Cemal Gursel Street is considered as a pedestrianized street too.

TC: High (near to a ferry stop / tramway stop / bus stop)

DV: High (banks, phone service, shops, food market, restaurants and cafes are present in the close vicinity)

3.3.5.2 K2: Zone K

RI: Intersection of pedestrianized roads RI2 (Kemal Pasa Street and 1728 Street). Same as K1 and in order to decrease the number of dropped pedestrians, only pedestrians who crossed the road and coming from the Izban, left and right side of the intersection are observed. While Kemal Pasa Street is a pedestrianized street, 1728 street is considered as pedestrianized road too.

TC: High (near to Izban Metro station and Turkish taxi dolmus station).

DV: High (banks, phone service, shops, food market, restaurants and cafes are present in the close vicinity)

3.3.5.3 K3: Zone K

RI: Intersection of pedestrian road and minor road RI2 (1690 Street and Mehmet Ihsan Zeyrek Street)

TC: Moderate (Izban Metro station is in less than 3 minutes' walk)

DV: Moderate (Small shops, restaurants and cafes are present in the close vicinity)

3.3.5.4 *K4: Zone K*

RI: Intersection of two minor roads RI3 (Metin Altiok Street and 1687 Street)

TC: Low (No transport around the point)

DV: Low (Located in mainly a residential area, a small park and some convenient stores are present in the area)

3.3.5.5 *K5: Zone K*

RI: Intersection of pedestrian and minor roads RI2 (1734 Street and 1728 Street)

TC: Moderate (The Izban Metro station and Turkish taxi dolmus station is in less than 3 minutes' walk)

DV: Moderate (Located next to A Baazar entrance, a hospital, shops, food market, banks etc. are present in the close vicinity)

3.3.5.6 *K6: Zone K*

RI: Intersection of minor roads RI3 (Fazil Bey Street and 1743 Street)

TC: Low (No transportation stops within the 5 minutes walking distance)

DV: Moderate (next to some shops and two High schools, shops, cafes, Forest public administration building is within 3 minutes walk)

3.3.5.7 *B1: Zone B*

RI: Intersection of major roads RI4 (Intersection of Ismaiel Sivri Street and Hasan Ali Yucel Boulevard)

TC: High (The origin is located next to Ferry Stop; Bus terminal and Tramway stop)

DV: Low (A small park is with in the view)

3.3.5.8 B2: Zone B

RI: Intersection of major roads RI5 (Intersection of Sehitler Boulevard and Balikci Parki ici Yolu)

TC: Moderate (The ferryboat station and tramway station are in less than 3 minutes' walk)

DV: High (Located in a commercial-recreational car-free area, park and shops are in the close vicinity)

3.3.5.9 B3: Zone B

RI: Intersection of minor roads RI3 (Intersection of 1735 Street and Muharrem Candas Street)

TC: Moderate (The Izban metro station in less than 3 minutes' walk)

DV: Low (Presence of elementary school, conveniences stores and bakery)

3.3.5.10 B4: Zone B

RI: Intersection of minor roads RI3 (Intersection of Sht. Kadir Turunc street and 1783 street)

TC: moderate (The Tramway station is in less than 3 minutes' walk from the viewer's perspective)

DV: Low (Elementary school, a convenience store in the corner, Beauty shop and restaurant are present in the close vicinity)

3.3.5.11 B5: Zone B

RI: Intersection of pedestrianized and minor roads RI2 (Intersection Sht. Cengiz Topel Street and 2018 Street)

TC: High (The origin is located next to a tramway station)

DV: High (A recreational/commercial street for leisure, Bank, kindergarten, music club, temporary marketplace on Wednesdays- the observations were done when this Bazaar was open- are present in the close vicinity)

3.3.5.12 B6: Zone B

RI: Intersection of minor roads RI3 (Intersection of 6350 street and 6347 street)

TC: Moderate (The Tramway station is in less than 3 minutes' walk from the viewer's perspective)

DV: Low (Located in mainly a residential area, kindergarten and a music club are present in the area)

Table 3.5 Characteristics of origin/ observation points

	RI	TC	DV
K1	RI1 Pedestrian and Pedestrian roads	High	High
K2	RI1 Pedestrian and Pedestrian roads	High	High
K3	RI2 Minor and pedestrian roads	Moderate	Moderate
K4	RI3 Minor and minor roads	Low	Low
K5	RI2 Pedestrian and minor roads	Moderate	Moderate
K6	RI3 Minor and minor roads	Low	Moderate
B1	RI4 Major and major roads	High	Low
B2	RI5 Major and pedestrian roads	Moderate	High
B3	RI3 Minor and minor roads	Moderate	Low
B4	RI3 Minor and minor roads	Moderate	Low
B5	RI2 Minor and pedestrian roads	High	High
B6	RI3 Minor and minor roads	Moderate	Low

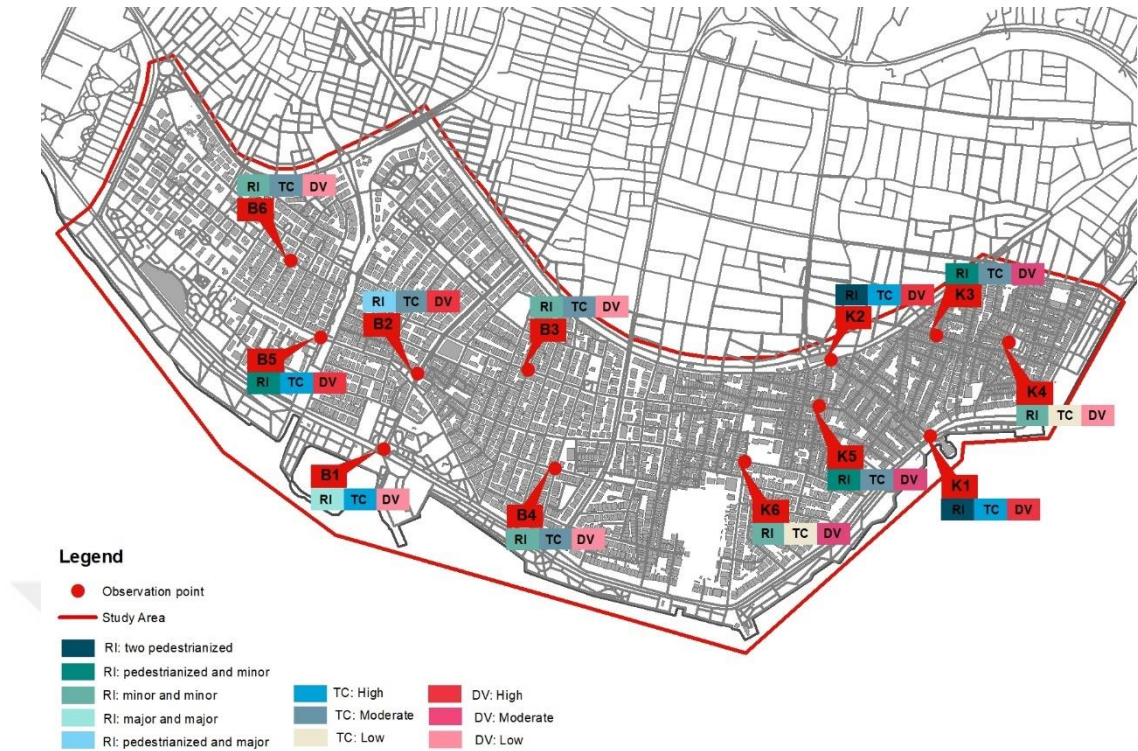


Figure 3.8 Characteristics of origin points based on RI, TC and DV variables

In brief based on the variation of three variables (RI, TC, DV), the origin of each observation represents eight types of urban areas (Figure 3.): 1- at the intersection of pedestrianized streets with high public transportation connectivity and high destination diversity, 2- at the intersection of minor traffic road and pedestrianized street next to commercial area with moderate public transportation connectivity and moderate destination diversity, 3- at the intersection of two minor roads with low public transport zones and low destination diversity, 4- at the intersection of two minor roads with low public transport zones and moderate destination diversity, 5- at the intersection of major roads with high public transportation connectivity and low destination diversity, 6- at the intersection of pedestrianized streets and major roads with high destination diversity and moderate public transportation connectivity, 7- at the intersection of pedestrianized street and minor roads with high destination diversity and high public transportation connectivity, and 8- at the intersection of minor roads with moderate public transportation connectivity and low destination variety.

The observations in selected sites (Zone K and Zone B), was conducted and completed in two weeks (September 16, 2019 to September 20, 2019 and from September 30, 2019 to October 3, 2019). The observations were completed in weekdays, from Monday to Friday and in peak hours, between 10:00am and 18:00pm. The weather conditions were similar through the observation period, which can be considered as pleasant weather for walking: sunny days with a temperature between 20° C and 30° C. In total 245 pedestrians were tracked (125 in Zone K and 120 in Zone B). However, some observations were excluded from the sample according to the duration of observation protocol (walking less than 5 minutes or remain in the same place more than 5 minutes). That remains 136 valid records from the collected data (74 in Zone K and 62 in Zone B). Table 3.6 provides information about how many observations were done, dropped and analyzed in each selected origin.

Table 3.6 Tracked, dropped and studied pedestrians in Zone K and Zone B

	Tracked	Dropped	Studied	% Dropped	% Studied
K1	22	9	13	41%	59%
K2	25	6	19	24%	76%
K3	17	7	10	41%	59%
K4	18	5	13	28%	72%
K5	21	13	8	62%	38%
K6	22	11	11	50%	50%
Zone K	125	51	74	41%	59%
B1	21	6	15	29%	74%
B2	18	10	8	56%	44%
B3	17	7	10	41%	59%
B4	25	18	7	72%	28%
B5	15	3	12	20%	80%
B6	24	14	10	58%	42%
Zone B	120	58	62	48%	52%

The detailed data for each pedestrian tracked at each observation point are demonstrated in the Appendix.

3.3.6 Examples of Tracked Pedestrians

3.3.6.1 Id :101232

The tracked walking trip started from the observation point K1 in Zone K. She was woman, young and wearing casual clothes, high heels and holding two bags. She was walking on a moderate speed. Most of people present at that time were walking on the same speed. At first, she was walking in the middle of the pedestrian street “Kemal Pasa Street” that relates the Karsiyaka ferry boat station to the Karsiyaka Izban station. She entered a simit place and went out after buying something to eat. Later, she got a phone call. At that time, she was trying to cross the street but a truck (camion) blocked her and didn’t let her to pass. She dropped off the sidewalk, walked a bit on the traffic road and then used the sidewalk once again. While walking, she faced a first obstacle: an electric pole, then a carpet in a bad condition, so she decided to drop off the sidewalk and kept on looking on the traffic street to check if a car is coming. The 10 minutes finished while she was walking.

3.3.6.2 Id: 143141

The tracked walking trip started from the observation point K6 in Zone K. She was woman, wearing casual clothes. She was with her friend/ sister. They used the sidewalk as much as possible. But at a certain point, her friend/sister dropped off the street because it was narrow, so she followed her and they walked on the road. The road was empty and no cars were coming. They were talking while walking. Before entering the pedestrian zone, the traffic road was full of cars, so they used the sidewalk. And entered cosmetic and beauty shop (Rossman).

CHAPTER 4

RESULTS AND ANALYSIS

In this chapter, first the descriptive information about the data will be discussed. Then the results of appendices will be highlighted.

4.1 Walking Behavior

Walking behavior is explored in each origin and compared in different physical environmental characteristics via 5 parameters (walking distance, walking time, route choice, walking speed and walking activities while walking).

4.1.1 Walking Distance

Descriptive statistics (the minimum, maximum, and average values) on walking distances in each origin in both zones is presented. In table 4.1 and table 4.2. Results showed that the overall average walking distance was **503m** (482m in zone K and 528m in zone B), the maximum walked distance was **998m** (864m in zone K and 998m in zone B) and the minimum walked distance was **109m** (147m in zone K and 109m in zone B). On site observations and these results showed that, the participants who walked the most distance were the ones who did not stop at all or the ones who walk alone without a company. On the other hand, the participants who walked the least distance were the ones who walk in groups (rather than alone) or the ones who walked about 5 minutes and stop or engage in other activities (talk with others etc.) at other times of the 10 minutes observation period. In brief, the walking distance ranged between 100 meters and 1000 meters (1Km). This distance is the normative walking distance suggested by walkability experts (Choi, 2012; Zacharias & Zhao et al. 2018; Kim, 2015).

Table 4.1 Minimum, maximum, and average values of walking distance in zone K

	K1	K2	K3	K4	K5	K6	Total
Count	13	19	10	13	8	11	74
Walking distance							
Min (m)	159	147	253	370	217	360	147
Max (m)	661	674	736	738	864	815	864
Average (m)	426	431	427	543	447	637	482

Table 4.2 Minimum, maximum, and average values of walking distance in zone B

	B1	B2	B3	B4	B5	B6	Total
Count	15	8	10	7	12	10	62
Walking distance							
Min (m)	109	248	258	236	221	281	109
Max (m)	782	609	871	819	741	998	998
Average (m)	506	449	466	593	493	682	528

Next walking distance will be compared based on the environmental characteristics around the origin (Public transportation connectivity TC, destination variety DV and road intersection RI).

Table 4.3 shows the descriptive statistics on how walking distance vary based on public transportation connectivity TC.

Results showed that in 10 minutes of observation period, people who pass from an origin point at the beginning of the observation which is connected to various transportation stops tend to walk less in terms of distance than people who pass from an origin which is connected to less transportation stops.

Table 4.3 Minimum, maximum and average values of walking distance according to public transportation connectivity TC

	TC High	TC Moderate	TC Low	Total
Count	59	53	24	136
Walking distance				
Average (m)	461	511	586	503

Table 4.4 shows the descriptive statistics on how walking distance vary according to destination variety DV. Results showed that as the destination variety around the

origin point at the beginning of the observation increases, the walking distance of people who pass from that origin decreases.

Table 4.4 Minimum, maximum, and average values of walking distance according to destination variety DV

	DV High	DV Moderate	DV Low	Total
Count	52	29	55	136
Walking distance				
Average (m)	447	512	551	503

Table 4.5 shows the descriptive statistics on how walking distance vary according to road intersection RI, results showed that people who pass from an intersection of a pedestrian street at the beginning of the observation of such as intersection of two pedestrian streets (RI1), intersection of pedestrian street and minor road (RI2) and pedestrian street and major road (RI5)) tend to walk less distances than those who pass other road intersection types (such as two minor roads intersections (RI3) and major roads (RI4)) at the beginning of the observation. This can be explained by the fact that people who walk around pedestrian streets engage in more activities or enjoy being in pedestrianized area.

Table 4.5 Minimum, maximum, and average values of walking distance according to road intersection RI

	RI 1	RI 2	RI 3	RI 4	RI 5	Total
Count	32	30	51	15	8	136
Walking distance						
Average (m)	429	459	582	506	449	503

Similarly, the ratio of participants who walk more than 500 meters were compared in different zones. Then the variation of such ratios were compared based on public transportation connectivity TC, destination variety DV and road intersection RI.

Table 4.6 shows that about half of pedestrians (49%) walked more than 500m: 46% in zone K and 52% in zone B. The ratio of participants who walked more than 500 meters ranged between 25% and 82% in zone K and 30% and 80% in zone B. This

result indicates that the distribution of participants who walk at least 500 meters is about equal in both zones.

Table 4.6 Walking distance more than 500m in zone K and zone B

	K1	K2	K3	K4	K5	K6	Total
>500	(4/13)	(7/19)	(4/10)	(8/13)	(2/8)	(9/11)	(34/74)
%	31%	37%	40%	62%	25%	82%	46%
	B1	B2	B3	B4	B5	B6	Total
>500	(8/15)	(3/8)	(3/10)	(4/7)	(6/12)	(8/10)	(32/62)
%	53%	38%	30%	57%	50%	80%	52%

According to the public transportation connectivity TC, in highly connected areas the ratio of participants who walked more than 500 meters was less (42%) than that of lowly connected areas (71%) (Table 4.7). This finding indicates a significant difference in walking distance based on transportation connectivity. In other words, people tend to walk more in areas with less public transportation connectivity than areas with higher public transportation connectivity. This can be explained by the fact that pedestrians enjoy being in connected areas where everything is accessible in short distance.

Table 4.7 Walking distance more than 500m according to Public transportation connectivity TC

	High	Moderate	Low	Total
> 500	(25/59)	(24/53)	(17/24)	(66/136)
%	42%	45%	71%	49%

According to road intersection RI, the ratio of participants who walked more than 500 meters ranged between 34% and 40% in intersections involving pedestrian streets (such as intersection of two pedestrian streets RI1, intersection of pedestrian street and minor road RI2 and pedestrian street and major road RI5) and 53% and 63% in intersection of other road types (such as minor roads RI4 and intersection of major roads RI3) (Table 4.8). This finding indicates a significant difference in walking distance based on the type of road intersection at the origin point of the observation. In other words, people tend to walk less around pedestrian streets perhaps because they enjoy walking and engage in various activities while walking (like chatting with the company etc.).

Table 4.8 Walking distance more than 500m according to road intersection RI

	RI 1	RI 2	RI 3	RI 4	RI 5	Total
> 500	(11/32)	(12/30)	(32/51)	(8/15)	(3/8)	(66/136)
%	34%	40%	63%	53%	38%	49%

For destination variety DV, results showed that the ratio of participants who walked more than 500 meters was higher in moderate and low destination areas compared to that in high destination areas (Table 4.9). This finding indicates a significant difference in walking distance based on the destination variety at the observation point. In other words, people tend to walk less in high destination variety areas (more activities), perhaps because they engage in various activities while walking (such as window shopping slows them down).

Table 4.9 Walking distance more than 500m according to destination variety DV

	High	Moderate	Low
> 500	(20/52)	(15/29)	(31/55)
%	39%	52%	56%

4.1.2 Walking Time

Table 4.10 and Table 4.11 shows the descriptive statistics (minimum, maximum, and average values) for observation period and walking period in both zones at each origin. Observation period refers to the whole period that pedestrian was observed and walking period refers to the period that a pedestrian really walked. Although the participants were intended to be observed for 10 minutes they were observed less when they enter in a building: their walking time is interrupted by various activities such as shopping, meeting someone, talking ... People were observed for at least five minutes (people who stop in indoor areas for more than 5 minutes were dropped from the sample). Yet the observed people were not always walking during the outdoor observation period. They engaged in several activities during their trip.

The average overall observation period was **8minutes and 22seconds** (8minutes 20seconds in Zone K and 8minutes and 20seconds in Zone B). The table 4.10 and table

4.11 show that the overall maximum observed time in both zones was **10minutes** (27 pedestrians walked for full 10 minutes in zone K and 25 pedestrians in zone B, respectively). The overall minimum observed time **5minutes and 3seconds** (5minutes and 9seconds (147m) in zone K and 5minutes and 3seconds (109m) in zone B). In brief, the observation period ranged between 5 and 10 minutes as planned.

Table 4.10 Minimum, maximum, and average values of observed time and walked time in zone K

	K1	K2	K3	K4	K5	K6	Total
Count	13	19	10	13	8	11	74
Observed time							
Min (min: sec)	05 :11	05 :09	06 :29	06 :09	05 :19	05 :43	05 :09
Max (min: sec)	10 :00	10 :00	10 :00	10 :00	10 :00	10 :00	10 :00
Average (min/sec)	07 :33	08 :20	08 :02	08 :55	08 :20	08 :53	08 :20
Walked time							
Min (min: sec)	03 :50	03 :02	03 :38	05 :53	03 :54	05 :43	03 :02
Max (min: sec)	09 :47	09 :28	09 :50	09 :58	10 :00	10 :00	10 :00
Average (min/sec)	05 :54	06 :41	06 :43	07 :47	06 :49	08 :35	07 :03

Table 4.11 Minimum, maximum, and average values of observed time and walked time in zone B

	B1	B2	B3	B4	B5	B6	Total
Count	15	8	10	7	12	10	62
Observed time							
Min (min: sec)	05 :03	05 :17	06 :03	05 :10	06 :01	05 :04	05 :03
Max (min: sec)	10 :00	10 :00	10 :00	10 :00	10 :00	10 :00	10 :00
Average (min/sec)	07 :33	08 :11	08 :06	08 :59	08 :59	08 :57	08 :23
Walked time							
Min (min: sec)	01 :43	02 :59	04 :18	05 :10	04 :08	05 :02	01 :43
Max (min: sec)	09 :41	10 :00	08 :59	10 :00	10 :00	10 :00	10 :00
Average (min/sec)	06 :26	07 :17	07 :17	08 :43	07 :33	08 :33	07 :30

The average overall walking period was **7minutes and 15 seconds** (7 minutes and 3 seconds in zone K and 7minutes and 30 seconds in zone B). The tables show that the maximum walking time in both zones was **10 minutes** (4 pedestrians in zone K and

15 pedestrians in zone B walked for full 10 minutes). The minimum walking time in both zones was **1minute and 43 seconds** (3minutes and 2 seconds (257m) in zone K and 1 minutes 43 (109m) in zone B, respectively). In brief, the walking duration ranged between 1minutes and 10 minutes. These results highlight that for an observation period of 10 minutes, some participants walk less than 2 minutes as they engage in various activities though out the observation period.

Next walking period will be compared based on the environmental characteristics around the origin (Public transportation connectivity TC, destination variety DV and road intersection RI).

For public transportation connectivity TC, results showed that people walk about 7 minutes in average (Table 4.12) in all types of TC. In other words, walking duration did not differ according to transportation connectivity around the origin.

Table 4.12 Minimum, maximum, and average values of walked time according to public transportation connectivity TC

	TC High	TC Moderate	TC Low	Total
Count	59	53	24	136
Walked time				
Average (min/sec)	06 :37	07 :32	08 :09	07 :15

For destination variety DV, results showed that people walk about 7 minutes in average (Table 4.13) in all types of destination variety. In other words, walking duration did not differ according to destination variation around the origin.

Table 4.13 Minimum, maximum, and average values of walked time according to destination variety DV

	DV High	DV Moderate	DV Low	Total
Count	52	29	55	136
Walked time				
Average (min/sec)	06 :47	07 :27	07 :35	07 :15

For the road intersection RI, people who walk around pedestrian street and minor road intersections RI2 and people who walk around pedestrian street and major road intersections RI5 at the beginning of the observation tend to walk around 7 minutes.

However, people who walk around pedestrian streets intersections RI1 and major roads intersection RI4 at the beginning of the observation tend to walk less in 10 minutes observation period than those who walk in the vicinity of two minor roads intersections RI3. In other words, pedestrians tend to walk less around pedestrian street intersections and major road intersections. This can be explained by the fact that pedestrians enjoy being in pedestrianized areas walk less and engage in other activities which decreases their walking time in a predefined observation period. Also, pedestrians around major road intersections may have to be involved in other activities (such as stopping and looking at the traffic flow to cross the street and to pass the other pedestrian) during their walk to avoid traffic accidents. Such activities may also decrease their walking time in a predefined observation period.

Table 4.14 Minimum, maximum, and average values of walked time according to road intersection RI

	RI 1	RI 2	RI 3	RI 4	RI 5	Total
Count	32	30	51	15	8	136
Walked time						
Average (min/sec)	06 :22	07 :05	08 :08	06 :26	07 :17	07 :15

4.1.3 Route Choice

Pedestrian's route selection was compared to the shortest possible route between origin and destination. The shortest route is defined as the shortest distance between the origin point (observation point) and the final destination throughout the pedestrian route network while the multiple stops along the route is taken into account. Figure 4.1 and Figure 4.2 present a simple graph of how each participants' route is coded as "the shortest route" or "not". Figure 4.1 shows an example of the route taken by the participant and Figure 4.2 shows the shortest possible route that could have been taken. In the figure, the street network is represented as grey lines, participants route is shown in dark blue line and shortest possible route is shown in light blue lines. Point A represents the origin point, point B represents the final destination and points in red represents a stop along the route. The ArcGIS Network Analyst Extension was used to calculate the shortest route for each pedestrian path after taking in to account the

multiple stops between the origin and destination points in 10 minutes observation period. Figure 4.2 is an example where the participants route is coded as “shortest route”.

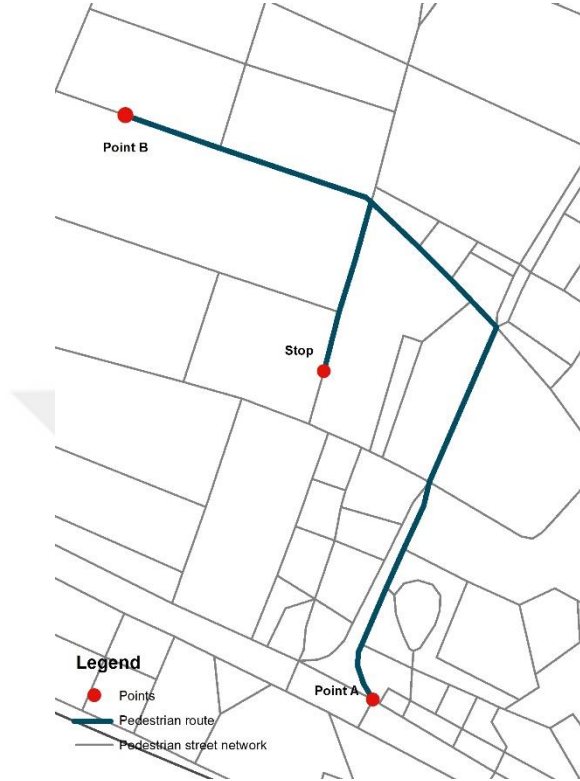


Figure 4.1 The route taken by pedestrian

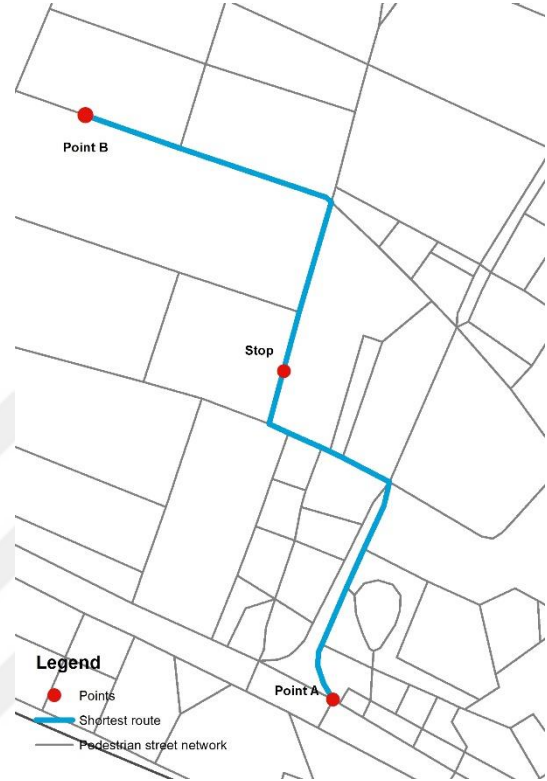


Figure 4.2 The shortest route

Table 4. 15 shows the ratio of pedestrians who chose “the shortest route” for both zones at each origin. Results showed that 89 out 136 (65%) of tracked pedestrians, walked the shortest routes: 66% in zone K and 65% in zone B. This result indicates that the ratio of participants who walk the shortest distance is about equal in both zones. Yet, when 12 origins were compared a wide range of variation was observed (from 30% (B6) to 92% (B5)). In other words, while majority (about 80% and 90%) of pedestrians around origins K2, K3, B3 and B5 took the shortest possible route, only a limited percentage of pedestrians (about 30% to 40%) took the shortest route around origins K5, B4 and B6. This can be explained by the fact that people who walk shorter, walked in direct paths. The street network around points K2, K3, B3 and B5 consists of main streets with less turns (less alternatives) in general. However, the street network around points K5, B4 and B6 consists of minor streets. This difference in

street network around different origins may have produced the difference in tendency of taking the shortest route or not.

Table 4.15 Route choice of tracked pedestrians in zone K and in zone B

	K1	K2	K3	K4	K5	K6	Total
Number of pedestrians who walked the shortest route	(7/13) 54%	(15/19) 79%	(9/10) 90%	(7/13) 54%	(3/8) 38%	(8/11) 73%	(49/74) 66%
	B1	B2	B3	B4	B5	B6	Total
Number of pedestrians who walked the shortest route	(9/15) 60%	(5/8) 63%	(9/10) 90%	(3/7) 43%	(11/12) 92%	(3/10) 30%	(40/62) 65%

Next route choice will be compared based on environmental characteristics around the origin (Public transportation connectivity TC, destination variety DV and road intersection RI).

For public transportation connectivity TC, results showed that pedestrians who walk around various transportation stops, tend to use the shortest routes more often than people who walk in areas with less transportation stops. This can be explained by the fact that pedestrians around public transportation stops walk for transportation, so they take the shortest route.

Table 4.16 Route choice of tracked pedestrians according to public transportation connectivity TC

	TC high	TC Moderate	TC Low	Total
Number of pedestrians who walked the shortest route	(42/59) 71%	(32/53) 60%	(15/24) 63%	(89/136) 65%

For destination variety DV, results showed that as the destination variety around the origin point increases, more people tend to use the shortest route. It is important to highlight that this finding contradicts with the expectations. One expects people in high density areas to engage in more activities and wander around rather than aiming to reach a specific destination. Yet this unexpected finding can be explained by the fact that the street network around high density areas involves major roads which connects various destinations via shortest possible routes.

Table 4.17 Route choice of tracked pedestrians according to destination variety DV

	DV high	DV Moderate	DV Low	Total
Number of pedestrians who walked the shortest route	(38/52) 73%	(20/29) 69%	(31/55) 56%	(89/136) 65%

For road intersection type, the ratio of people who walk through the shortest route ranged between 59% in RI3 and 77% in RI2. People who walk around pedestrian streets intersection (RI1) and pedestrian street and minor road intersection (RI2) at the beginning of the observation tend to use the shortest road. However, at the intersection of two minor roads (RI3), major roads (RI4) and major road and pedestrian street (RI5) points, less people used the shortest roads. There is no clear explanation, why people who walk in pedestrianized areas tend to use the shortest roads more often than other areas. Future studies should investigate the reasons.

Table 4.18 Route choice of tracked pedestrians according to road intersection RI

	RI 1	RI 2	RI 3	RI 4	RI 5	Total
Number of pedestrians who walked the shortest route	(22/32) 69%	(23/30) 77%	(30/51) 59%	(9/15) 60%	(5/8) 63%	(89/136) 65%

4.1.4 Walking Speed

Table 4.19 shows the percentage of participants in each zone and at each origin with various walking speeds. About half of pedestrians (52%) walked on moderate speed. This finding did not differ between zones (47% in zone K and 58% in zone B). However, the percentage of participants who walk in various speeds differ between zones. In zone K more pedestrians tend to change their speed while walking (20%) than those in zone B (8%). This can be explained by the fact that zone K is the main core of the Karsiyaka Municipality (see page 31), so it has a higher pedestrian and traffic density. This high density may have led to changes in pedestrian walking speeds.

Table 4.19 Walking speed of tracked pedestrians in zone K and zone B

	Zone K	Zone B	Total
Percentage of pedestrians who:			
Walked at a Moderate Speed	47%	58%	52%
Walked at a Slow Speed	22%	19%	21%
Walked at a High Speed	11%	15%	13%
Changed the speed while walking:	20%	8%	15%

Next walking speed will be compared based on the environmental characteristics around the origin (Public transportation connectivity TC, destination variety DV and road intersection RI).

For different transportation connectivity TC, the percentage of people who walk in moderate, slow and high speed did not change (Table 4.20) (about %50, %20 and %10). However, in highly connected areas more people tend to change their speed (24%) of those who walk in low transportation connectivity areas (8%). This is an expected finding; high traffic density may force people to change their speed while walking.

Table 4.20 Walking speed of tracked pedestrians according to transportation connectivity TC

	High	Moderate	Low	Total
Percentage of pedestrians who:				
Walked at Moderate	46%	58%	54%	52%
Walked at Slow	19%	21%	25%	21%
Walked at High Speed	12%	13%	13%	13%
Changed the speed while walking:	24%	8%	8%	15%
- Moderate + Slow	12%	6%	0%	7%
- Moderate+ Speed	8%	2%	8%	6%
- High Speed + Slow	3%	0%	0%	1%

For different destination variety DV, the percentage of people who walk in moderate, slow and high speed did not change (Table 4.21) (about %50, %20 and %10). However, in highly-density destination variety areas more people tend to change their speed (23%) of those who walk in low-density destination variety areas (8%). This is an expected finding; the presence of more destination may force people to

change their speed while walking (slow down by a window, accelerate after walking slowly or follow the pedestrian speed on the street).

Table 4.21 Walking speed of tracked pedestrians according to destination variety DV

	High	Moderate	Low	Total
Percentage of pedestrians who:				
Walked at a Moderate Speed	44%	48%	62%	52%
Walked at a Slow Speed	23%	24%	16%	21%
Walked at a High Speed	10%	14%	15%	13%
Percentage of pedestrians who changed the speed while walking:	23%	8%	8%	15%
- Moderate + Slow	12%	3%	5%	7%
- Moderate+ Speed	8%	10%	2%	6%
- High Speed + Slow	4%	0%	0%	1%

For different road intersection RI, the percentage of people who walked in moderate speed did not change (Table 4.22) (about 50%). However, in road intersection type (RI1) – intersection of two pedestrian streets – people tend to change their speed (34%), comparing to other road intersection types (between 3% and 9%). This can be explained by the fact that pedestrians in pedestrianized areas tend to follow the flow on the street or pass other people and accelerate.

Table 4.22 Walking speed of tracked pedestrians according to road intersection RI

	RI1	RI2	RI3	RI4	RI5	Total
Percentage of pedestrians who:						
Walked at Moderate Speed	41%	47%	59%	60%	63%	52%
Walked at Slow Speed	16%	33%	20%	7%	25%	21%
Walked at High Speed	9%	13%	16%	13%	0%	13%
Percentage of pedestrians who changed the speed while walking:	34%	6%	9%	9%	3%	15%
- Moderate + Slow	16%	3%	2%	13%	13%	7%
- Moderate+ Speed	13%	3%	4%	7%	0%	6%
- High Speed + Slow	6%	0%	0%	0%	0%	1%

4.1.5 Activities while Walking

In this part, first the amount of activities, then the type of activities will be compared in both zones and based on the environmental characteristics around the origin (public transportation connectivity TC, destination variety DV and road intersection RI).

Activities (please see pages 29, 30 and 31 for further explanations) were grouped into two categories; (1) Necessary or utilitarian activities versus (2) Optional or recreational activities. In this study, necessary or utilitarian activities refers to activities that pedestrians engaged in everyday such as going to work, school, services, shopping, public transit and going back home. Shopping is classified into three groups: grocery food (supermarket, bakery shop, convenience store), specialized retail store (clothing, accessories, gift store, bookstore, cosmetics) and window shopping (staring in front of a shop window for some seconds). Optional or recreational activities refers to activities that pedestrians engaged for fun such as walking to the park, cafes and restaurant, a show or a gym. Moreover, data on other types of pedestrian activities such as having conversation with others (talking with pedestrians or neighbours, shopkeepers), meeting pedestrians and greeting, walking the dog, looking to the built environment was also collected. Results on such activities will be presented later.

Table 4.23 Classification of necessary or utilitarian activities and optional or recreational activities

Necessary or utilitarian activities	Optional or recreational activities
<ul style="list-style-type: none">- going to work,- going to school,- going to service- going to public transit- going back home- shopping	<ul style="list-style-type: none">- walking to the park,- walking to cafes and restaurant,- walking to a show- walking to a gym

Results showed that the majority of participants (86%), engaged in at least one activity while walking. This finding did not differ between the two zones; 91% in zone K and 81% in zone B (Table 4.24) When the 12 origins were compared (Table 4.24), the percentage of pedestrians engaged in at least one activity varies between 64% and 100% in zone K and 60% and 100% in zone B. This finding again supports the similarity between two zones in terms of number of activity engagement.

Table 4.24 Pedestrians engaged in at least one activity in zone K and zone B

	K1	K2	K3	K4	K5	K6	Total
At least one activity	(13/1 3) 100%	(19/19) 100%	(10/10) 100%	(10/13) 77%	(8/8) 100%	(7/11) 64%	(67/7 4) 91%
	B1	B2	B3	B4	B5	B6	Total
At least one activity	(14/1 5) 93%	(8/8) 100%	(9/10) 90%	(5/7) 71%	(8/12) 67%	(6/10) 60%	(50/6 2) 81%

Next the number of pedestrians who engaged in activities will be compared based on the environmental characteristics around the origin (public transportation connectivity TC, destination variety DV and road intersection RI).

For public transportation connectivity TC, results showed that as transportation connectivity increases from low to high, the percentage of people who engage in at least one activity increases. In parallel, the number of activities increases from low to high TCs (from 1 activity to 1.54 activity). People tend to walk more and engage in more than one activity in highly connected areas. This can be explained by the environmental affordance theory, highly connected areas are mixed used areas and they afford more opportunities and more activities.

Table 4.25 Pedestrians engaged in at least one activity according to public transportation connectivity TC

	TC High	TC Moderate	TC Low	Total
Pedestrians engaged in at least one activity	(54/59) 92%	(46/53) 87%	(17/24) 71%	(117/136) 86%
Number of activities at point	(91/59) 1.54	(76/53) 1.43	(25/24) 1.04	(192/136) 1.41

For destination variety DV, results showed that as the destination variety around the origin point at the beginning of the observation increases, more people tend to engage in at least one activity. In parallel, the number of activities increases from low to high DVs (from 1.16 activity to 1.63 activity). This can be explained with the theory

of environmental affordances. When the setting offers various activities via the presence of various destinations, people use it and engage in more activities in such areas.

Table 4.26 Pedestrians engaged in at least one activity according to destination variety DV

	DV High	DV Moderate	DV Low	Total
Pedestrians engaged in at least one activity	(48/52) 92%	(25/29) 86%	(44/55) 80%	(117/136) 86%
Number of activities at point	(82/52) 1.63	(46/29) 1.59	(64/55) 1.16	(192/136)1.41

According to road intersection RI, results showed that pedestrians tracked from points in pedestrianized zones (RI1 and RI2) tend to engage in more activities than the pedestrians in other types of areas. This can be explained by the fact that pedestrians in pedestrianized areas tend to involve more activities while walking.

Table 4.27: Pedestrians engaged in at least one activity according to road intersection RI

	RI 1	RI 2	RI3	RI4	RI5	Total
Pedestrians engaged in at least one activity	(32/32) 100%	(26/30) 87%	(37/51) 73%	(14/15) 93%	(8/8) 100%	(117/136) 86%
Number of activities at point	(58/32) 181%	(51/30) 170%	(52/51) 100%	(20/15) 133%	(11/8) 138%	(192/136) 141%

Table 4.28 and Table 4.29 shows utilitarian and recreational activities in both zones. Results showed that; more people tend to engage in utilitarian activities than recreational activities (In zone K; among 74 people; 54 engaged in utilitarian activities, 6 engaged in recreational activities and 7 engaged in both activities, 7 didn't engage in any activity; in zone B: among 62 people; 37 engaged in utilitarian activities, 8 engaged in recreational activities, 5 engaged in both activities and 12 didn't engage in any activity). This ratio differs between two zones; the percentage of people who engaged in recreational activities was higher in zone B than zone K. This can be explained by the fact that zone K is a utilitarian area (involve destinations such as schools etc.) whereas zone B is a recreational area (involves park, cafes and restaurant etc.). In addition, when the ratio of people who engage in utilitarian and recreational

activities were compared between different origins, results remain the same. Among all 12 origins except for origin B4 (43%), the percentage of people who engage in utilitarian activities was higher than recreational activities (K1:8/3; K2: 17/0, K3: 7/1, K4: 10/0; K5:8/0; K6:4/2; B1: 9/2; B2: 7/0; B3: 8/1; B5: 6/1 B6: 5/1).

Table 4.28 Activities pedestrians engaged while walking in zone K

	K1	K2	K3	K4	K5	K6	Total
Total Number of people	13	19	10	13	8	11	74
Utilitarian							
Number of engaged pedestrians	8	17	7	10	8	4	54
Percentage of activities	(17/13) 131%	(29/19) 153%	(17/10) 170%	(17/13) 131%	(15/8) 188%	(4/11) 36%	(99/74) 134%
Recreation							
Number of engaged pedestrians	3	0	1	0	0	2	6
Percentage of activities	(3/13) 23%	(0/19) 0%	(1/10) 10%	(0/13) 0%	(0/8) 0%	(2/11) 18%	(6/74) 8%
Both Utilitarian and recreation							
Number of engaged pedestrians	2	2	2	0	0	1	7
Percentage of activities	(4/13) 31%	(5/19) 26%	(5/10) 50%	(0/13) 0%	(0/8) 0%	(2/11) 18%	(16/74) 22%
Total activities	(24/13) 185%	(34/19) 179%	(23/10) 230%	(17/13) 131%	(15/8) 188%	(8/11) 73%	(121/74) 163%

Table 4.29 Activities pedestrians engaged in while walking in zone B

	B1	B2	B3	B4	B5	B6	Total
Total Number of people	15	8	10	7	12	10	62
Utilitarian							
Number of engaged pedestrians	9	7	8	2	6	5	37
Percentage of activities	(12/15) 80%	(8/8) 100%	(12/10) 120%	(3/7) 43%	(10/12) 83%	(7/10) 70%	(52/62) 84%
Recreation							
Number of engaged pedestrians	2	0	1	3	1	1	8
Percentage of activities	(2/15) 13%	(0/8) 0%	(1/10) 10%	(3/7) 43%	(1/12) 8%	(1/10) 10%	(8/62) 13%
Both Utilitarian and recreation							
Number of engaged pedestrians	3	1	0	0	1	0	5
Percentage of activities	(6/15) 40%	(3/8) 38%	(0/10) 0%	(0/7) 0%	(2/12) 17%	(0/10) 0%	(11/62) 18%

Table 4.29 continues

	B1	B2	B3	B4	B5	B6	Total
No activities	1	0	1	2	4	4	12
Total activities	(20/15) 133%	(11/8) 138%	(13/10) 130%	(6/7) 86%	(13/12) 108%	(8/10) 80%	(71/62) 115%

Note, some pedestrians may be engaged in both types of activities along the route. For example; in zone K, 7 pedestrians (22%) and in zone B, 5 pedestrians (18%) involved in both types of activities (utilitarian (utilitarian and recreational) along the route. Table 4.30 shows the activities that those pedestrians were engaged in along the route by origin.

Table 4.30 Pedestrian that engaged in both types of activities

Pedestrian id	Origin	Utilitarian activity	Recreational activity
1	K1	Window shopping	Park
2	K1	Bank	Show
3	K2	Convenience store	Café
4	K2	Grocery	Café
5	K3	Window shopping	Restaurant
6	K3	Retail office	Restaurant
7	K6	Bank	Café
8	B1	Electric supply store	Park
9	B1	ATM bank	Restaurant
10	B1	Fish store	Café
11	B2	Tobacco store	Café
12	B5	Bank	Pub

Similarly, some participants engage in more than one utilitarian activity. For example, they may stop by a school and home along the route. When the destinations in utilitarian walks were investigated, results showed that majority of pedestrians walk to shopping areas (70% in zone K and %50 in Zone B) and less people walk to services (15% in zone K and %16 in zone B) or home (7% in zone K and %22 in zone B). Among those who shopped, in zone K 35 % entered grocery stores, 36 % entered specialized retail stores and 29 % stopped by shop windows. In zone B, 56 per cent

entered grocery stores, 19 per cent entered specialized retail stores and 26 per cent stopped by shop windows. All those who stopped by shop windows, entered to at least to one shop in both zones. When activities in recreational walks were investigated, results showed that participants tend to enjoy cafes and restaurants (17 pedestrians) more than parks (7 pedestrians).

Next, the percentage of utilitarian and recreational activities will be compared in three different environmental characteristics (public transportation connectivity TC, destination variety DV and road intersection RI).

For public transportation connectivity TC, results showed that; more people tend to engage in utilitarian activities than recreational activities in all types of TCs (Table 4.31). In “low TC” settings 21 of 25 activities (%84), in “moderate TC” settings 62 of 76 activities (%82) and in “high TC” settings 68 of 91 activities (%75) were utilitarian activities. In other words, in all types of transportation connectivities, the percentage of people who engage in utilitarian activities was higher. Table 4.31 also shows that as the transportation connectivity around the origin point at the beginning of the observation increases, people tend to engage in more utilitarian activities than those tracked in low TC.

Table 4.31 Activities pedestrians engaged in while walking according to public transportation connectivity TC

	TC High	TC Moderate	TC Low	Total
Total Number of people				
Number of pedestrians who engaged in at least one activity	54	46	17	117
- Total utilitarian activities	68	62	21	151
- Total recreational activities	6	6	2	14
- Total both activities	17	8	2	27
Total activities	91	76	25	192
Number of pedestrians who didn't engage in any activity	5	7	7	19

For public destination variety DV, results showed that; more people tend to engage in utilitarian activities than recreational activities in all types of DVs (Table 4.32). In “low DV” settings 51 of 64 activities (80%), in “moderate DV” settings 36 of 46 activities (78%) and in “high DV” settings 64 of 82 activities (78%) were utilitarian activities. In other words, in all types of destination variety, the percentage of people who engage in utilitarian activities was higher. There is no pattern to this finding.

Table 4.32 Activities pedestrians engaged in while walking according to destination variety DV

	DV High	DV Moderate	DV Low	Total
Total Number of people				
Number of pedestrians who engaged in at least one activity	48	25	44	117
- Total utilitarian activities	64	36	51	151
- Total recreational activities	4	3	7	14
- Total both activities	14	7	6	27
Total activities	82	46	64	192
Number of pedestrians who didn't engage in any activity	4	4	11	19

For road intersection RI, results showed that; more people tend to engage in utilitarian activities than recreational activities in all types of RI's (Table 4.33). In RI1 origin 46 of 58 activities (79%), in RI2 origin 42 of 51 activities (82%), in RI3 origin 43 of 52 (83%), in RI4 origin 12 of 20 (60%) and in RI5 origin 8 of 11 activities (73%) were utilitarian activities. In other words, in all types of road intersection, the percentage of people who engage in utilitarian activities was higher. Table 4.33 also shows that around RI1, RI2 and RI3 people tend to engage in more utilitarian activities, than those tracked in RI4 and RI5. This finding should be explored in further studies.

Table 4.33 Activities pedestrians engaged in while walking according to road intersection RI

	RI 1	RI 2	RI3	RI4	RI5	Total
Total Number of people	32	30	51	15	8	136
Number of pedestrians who engaged in at least one activity	32	26	37	14	8	117
Total utilitarian activities	46	42	43	12	8	151
Total recreational activities	3	2	7	2	0	14
Total both activities	9	7	2	6	3	27
Total activities	58	51	52	20	11	192
Number of pedestrians who didn't engage in any activity	0	4	14	1	0	19

In addition to these above analyses, finally, utilitarian activities in general and shopping activities in specific will be compared based on destination variety DV.

When the destinations in utilitarian walks (including those, who engaged in both utilitarian and recreational activities) were investigated, results showed that majority of pedestrians walk to shopping areas (about %60) in all types of DV. However, in moderate and high DV people tend to walk to services more often (about %20) than they do so low DV (about %9). Similarly, people tend to walk to home more often in low and Moderate DV (about %20) than they do so in high DV (about %3). This is an expected finding: High diversity variety involve less housing and more commercial buildings.

Table 4.34 Utilitarian activity type according to destination variety DV

	DV high	DV moderate	DV low	Total
Shopping percentage/ total utilitarian (activities)	(44/72) 61%	(25/40) 63%	(33/54) 61%	(102/166) 61%
Services percentage/ utilitarian (activities)	(16/72) 22%	(6/40) 15%	(5/54) 9%	(27/166) 16%

Table 4.34 continues

	DV high	DV moderate	DV low	Total
Home percentage/ utilitarian (activities)	(2/72) 3%	(8/40) 20%	(11/54) 20%	(21/166) 13%

Among those who shopped, in Low DV people tend to shop in grocery shops more often and in moderate DV they tend to shop in grocery shops, specialized shops and or stop by for window shopping and in high DV they shop in grocery shops and specialized shops.

Table 4.35 Type of shopping activities according to destination variety DV

	DV High	DV Moderate	DV Low	Total
Grocery percentage/ shopping (activities)	(17/44) 39%	(8/25) 32%	(16/33) 48%	(41/102) 40%
Specialized percentage/ shopping (activities)	(16/44) 36%	(9/25) 36%	(7/33) 21%	(32/102) 31%
Window shopping/ shopping (activities)	(11/44) 25%	(8/25) 32%	(10/33) 30%	(29/102) 28%

4.2 General Results on Pedestrian Behavior and Physical Environmental Features

As explained in the methodology part, some observations were coded systematically, such as walking distance, time speed etc. Such objective observations were compared based on the physical environmental features in the preceding part (Part 4.1). However, during the observations some important issues were also noted (given in appendices). In this part general evaluation that is derived from such observations will be discussed. In other words, a summary of appendices will be presented.

4.2.1 Walking an Act of Socialization

In Karşıyaka, people do not only walk to reach a destination, they consider walking as an act of socialization. We understand that from their pace (low speed) and from the activities they are involved in (stop by various destinations, talk with other people,

etc...). Our observation made us affirm that almost half of the pedestrians walk alone, while the rest tend to walk accompanied by other people (partner, child, friend, pet...). During their walk they tend to stop by various destinations (shops, banks, green area). They also like to rest whenever they find a bench, or stop by green areas/ parks. Meanwhile in Bostanlı, and since it is mainly a residential area, people tend also to socialize while walking but not as much as people in Karşıyaka do. This difference can be stemmed from the fact that Karşıyaka zone is dominated by pedestrian paths and commercial areas while Bostanlı is dominated by residential areas and sidewalks. Given that, urban designers should consider urban furniture which may improve pedestrian comfort and help them to socialize. In other words, pedestrian streets along the commercial areas should involve benches or parks where people can socialize.

4.2.2 Walking Pace, Pedestrians Density and Influence of the Interaction with The Environment

Through our observation, we noticed that when people are walking on slow or moderate speed they tend to look around and enjoy the physical features (such as building facades, shop windows, balconies) and social activities (street dance show, etc.) and street vendors surrounding them. However, when they were walking fast, walking to a destination or on the phone, they barely communicate with the physical and social environment. As well as in crowded streets, people tend to look around less. Given that, urban designers should consider the variety of activities in less crowded and low pace streets. Having various activities on a high pace crowded streets may contradict with the behaviour.

Although people tend to walk on the same speed when they are sharing the same area; it is important to note that, people change their speed along the path. In commercial streets, people interact with the environment and walk on slow or moderate speed, so they can enjoy the area. Yet, their speed and behaviour changes based on the street density and their activities. For example, people who walk directly to destination, they tend to walk fast and do not attend their surroundings. On the other hand, people who shop tend to walk slow and they seem to walk for pleasure or

socialize. They tend to attend their physical environment more and they also stop to rest while walking. Slow walkers in commercial areas, where pedestrian density is high; often walk opposite to the flow of fast walkers. Thus, they slowdown the pace of other people who needs to pass the area to reach a destination. This contradiction in pedestrian needs (who walk for pleasure and who walk for transportation) creates an uncomfortable setting for both groups (fast and slow walkers). Given that urban designers should pay attention to pedestrian path width and pavement in commercial environments and create lanes for pedestrians of different paces so that fast and slow walkers can share the same setting comfortably.

On site observations also showed that, people rely on their phone more than the physical environment for wayfinding aids. Our finding may stem from limitations of the physical environment (as environment does not provide enough aids, such as landmarks etc. for people to find their way) or changes in life styles as people tend to use technology in all parts of their life. If this finding relates to lack environmental affordances, then future studies should discuss how people's reliance on mobile applications should be reduced by better design. Good street design supposed to reduce pedestrian's dependence on technology and allow them to get more enjoyment out of their surroundings.

People involve in various activities along their walk, they also stop by various destinations. As expected, in Bostanlı the observation usually ends in apartments whereas in Karşıyaka it ends in shops etc. similarly, people use park areas more often in Bostanlı. Besides that, in ten minutes' observation in Bostanlı people stop by shops or other destinations less than they do in Karsiyaka. Also, some people walk to destination (usually to café or restaurant or bank), which is a good indicator of walkable cities.

Generally, pedestrians accompanied with children or dogs, tend to avoid crowded areas and decrease their speed of walking. They opt for alternative routes, that might be longer, but may lead them to their desired destination. Given that, urban designers should consider alternative routes to crowded and high pace streets where pedestrians

accompanied with children and dogs can enjoy. The pedestrian system should have all such kind of activities.

4.2.3 Pedestrian Comfort

We noticed that in many cases, people tend not to use the shortest path, they chose the longer routes to avoid crowded areas, to attend commercial areas, to walk with their child or dog more safely, to avoid direct sunlight, to look for shadows, benches, garbage cans, street vendors...

In addition, people who socialize tend not to use the shortest path, some prefer the main pedestrian street, others use secondary streets instead of main street. Given that, urban designers should consider improving pedestrian comfort along secondary roads as people who walk for socialization and recreation tend to use such streets more often than they use major streets. On the contrary as major streets are preferred more by short cutters who aim to reach a destination may not require all types of pedestrian comfort elements. For example, more benches and garbage can be placed on the secondary roads than the major paths.

It is important to note that disabled people encounter with barriers even in ten minutes observation. It seems that it is hard for them to travel longer distances. Given that, urban designers should design streets for all (disabled, elderly and children).

4.2.4 Sidewalk and Pedestrian Area

Since the area of Karşıyaka is dominated by pedestrian areas, people are used to dominate the entire streets. However, the Bostanlı site is mainly characterized by the presence of sidewalks. People tend to use sidewalk more often than those in Karşıyaka. This is can be due to three main reasons: first the width of the walking paths, second for traffic safety purposes and third for the absence of any other opportunity for pedestrian experiences. Given that, urban designers should design more pedestrian streets in order to create enhance the pedestrian safety and experience.

Not all pedestrians use the sidewalk regularly. In-situ observations showed that sidewalks are used when roads are narrow or if it is crowded of cars. In this case, the presence of cars is important to determine the pedestrian's behavior, as well as their speed. Narrow sidewalk, various barriers along the path, are reasons that make people walk on the traffic road rather than the sidewalk. It is important to note that old people may insist on walking on the sidewalk. In some zones, some pedestrians use the sidewalk, others never use it (perhaps because of poor conditions such as lack of connectivity, inappropriate width and pavement or presence of barriers) , and others alternate between sidewalk and traffic lane while walking. Physical environmental qualities may be preventing continuous walking on the sidewalk and pedestrians prefer traffic lanes when safe. In ten minutes' observation, almost all the participants drop off the sidewalks and walk on the traffic road. The barriers and width of the sidewalk seem to be the main problem on sidewalks (rather than bad quality of sidewalk pavement etc). Given that if urban designers aim to have more pedestrians on the sidewalks than on traffic route, they should obey the standards for sidewalk width and decision makers should ensure that that width is not lessened by various barriers.

Observations showed that, pedestrians usually prefer using car-free streets (pedestrianized streets), even though the itinerary might be longer. This is an expected outcome as pedestrianized streets offer better walking experience by providing commercial variety, no traffic risk, higher security and higher opportunity to interact with other pedestrians as well. On the other hand; some specific group of people (walking with a child or a dog) avoid using pedestrianized streets. Such streets are less safe for them as more crowded and their ability to walk on their pace is interrupted by others. Pedestrian streets involve all types of users: pedestrian walking fast or slow, pedestrian who are alone or who are walking with others, young old or children. That's why pedestrian streets should be designed to be wide enough for different paces and afford comfortable walk for all (disabled, elderly and children), those walking alone, in a group, slow or fast. Streets should be wide enough for different paces. Also, crowd should be scattered around by making intersecting streets as much interesting as the main pedestrian street so that people walking for recreation should prefer that route as well.

4.2.5 Crossing the Street

Crossing the street requires attention. Only limited number of participants cross the street easily. Those walking with their child, they use traffic aids.

At major streets people tend to use the crossing path. However, they fail to use traffic lights. Most of them wait for the street to get empty and not when the light is green. The eye contact with the driver seems to be more important than the traffic lights. In secondary streets, people tend not to use traffic light to cross a street. They cross the street not only at the end points but at all possible points along the path. Given that, special attention should be paid to traffic calming instruments in high risk areas (such as streets around the school or park). Moreover, as people are reluctant to ensure their own safety while crossing the street some creative urban design interventions might block their view and discourage them to cross along the path and force them to walk till the cross point.

4.2.6 Use of Parks

In ten minute observations; some walks ended in parks. Most of those who walk to parks are elderly and people with children. In the case study area parks are within a 10 minutes' walk of main intersections, which is a good indicator of walkable cities. Public parks, pocket parks and green areas are important settings to enhance the pedestrian experience.

CHAPTER 5

CONCLUSIONS

This thesis studied the pedestrian experience in urban settings and investigated the relation between environmental characteristics and pedestrian behavior. Actually, people do walk from one point to another, however, this study showed that people often walk for other reasons than reaching a destination. Within the scope of the thesis, firstly, 5 walking behavior parameters (walking distance, walking time, route choice, walking speed and walking activities while walking) of 136 tracked pedestrian were investigated. Then, the pedestrian behavior was compared across different environmental qualities. The empirical study was conducted in the district of Karsiyaka in Izmir city as it represents the general layout of the other neighbourhoods in Izmir and in Turkey. Observations were held in two neighbourhoods: zone K and zone B. Zone K is a utilitarian area (involve destinations such as schools etc.) whereas zone B is a recreational area (involves park, cafes and restaurant etc.).

Our study made us affirm pedestrian walk to socialize: they walk in groups, stop by different destination and interact with the different environment. The physical environment plays an important role on encouraging people to walk and affect their walks. Offering a destination variety, proximity to green areas, street furniture and street activities affect the pedestrian behavior. People walking around high destination variety areas engage in various activities. However, results showed people tend to engage in utilitarian activities more than recreational activities in all types of destination variety areas. People enjoy shops, cafes and restaurants. Furthermore, people do like to walk in pedestrianized areas, even though the itinerary might be longer. People who walk around pedestrian streets walk less in ten minutes because they engage in more activities. They also follow the flow on the street and enjoy being in pedestrianized area. Actually, when people are walking on slow or moderate speed they tend to look around and enjoy the physical features (such as building facades, shop windows, balconies) and social activities (street dance show, etc.) and street vendors surrounding them. It is important to note that findings of this study are applicable or valid in similar cases.

As an urban designer, we assume that the physical environment should afford streets for all kind of pedestrians: those walking alone or with others, children young or old, slow or fast, utilitarian and leisure. Streets should be designed to be interesting to walk and create places where pedestrian connect with the surroundings – social activities, more road intersections, car free streets, plazas, pop up shops and a show. This does not mean that cities should have more pedestrianized streets or traffic lanes should turn into pedestrian lanes. It is important to design the street and the city in order to create a balance between all means of transport. Pedestrians behavior varies by their needs which vary based on their aim of walk (to reach a destination, to exercise or to recreate). It is not possible to design one type of street that meets all kinds of needs. Rather street network, and potential needs of pedestrians needs in various areas should be understood clearly. Some streets would be dominated by fast pedestrians who aim to reach a destination and reluctant to attend the beauty in the environment and need to walk on a safe sidewalk pavement without barriers and with appropriate width. Some other street segments would be dominated by slow pedestrians who walk for recreation aim to socialize along the path with others and willing to be involved in various activities and some other street segments would involve both the fast and slow walkers. Given that, before designing the street; the street network should be analysed according the potential pedestrians' speed, aim, activities etc. based on surrounding land uses and amenities. Only with such knowledge, the street design can offer the required physical characteristics accordingly. The street design should encourage people to enjoy the physical environment but it also to offer them a multitude of choices.

Finally, future studies are on call as some findings contradicts with the expectations. For example; in this study; walking duration differ neither according to transportation connectivity around the origin nor according to destination variation around the origin. A further study may investigate the reasons of this unexpected finding and focus on other physical environmental features that may influence walking duration. Similarly in this study, people in pedestrianized areas tend to took the shortest route. A better extension of this study may investigate why people who walk in pedestrianized areas

tend to use the shortest roads more often than other areas and why people in high density areas tend to use the shortest route.

Despite all the shortcomings this study is important in methodology it offers to trace pedestrian behaviour and analyze the street network accordingly. With such behavioural analyses it is possible to understand how pedestrians needs vary among different areas in the street network. Only with such knowledge it is possible to improve the street design accordingly. Otherwise any design should look good but may not meet the user's needs.



REFERENCES

- Asakura, Y. & Iryo, T. (2007). Analysis of tourist behavior based on the tracking data collected using a mobile communication instrument. *Transportation Research Part A: Policy and Practice*, 41(7), 684–690.
- Alfonzo, M. & Boarnet, M.G. (2008). The relationship of neighbourhood built environment features and adult parents' walking. *Journal of Urban Design*, 13(1), 29–51.
- Blivice, S. (1974). *Pedestrian route choice: a study of walking to work in Munich*. PhD thesis, University of Michigan, Michigan.
- Boyle, A., Barrilleaux, C., & Scheller, D. (2014). Does walkability housing prices. *Social Science Quarterly, Southwestern Social Science Association*, 95(3), 852-867.
- Bradshaw, C. (1993). Creating and using a rating system for neighborhood walkability: Towards an agenda for local heroes. *International Pedestrian Conference*, 14, Boulder, Colorado., USA, 1 October 1993.
- Cambra, P. (2012). *Pedestrian accessibility and attractiveness indicators for Walkability*. Phd Thesis, Tecnico Lisboa, Lisbonne.
- Cerin, E., B. E. Saelens, J. F. Sallis, & L. D. Frank. (2006). Neighborhood Environment walkability scale: validity and development of a short form. *Medicine Science in Sports Exercise*, 38(9), 1682–1691.
- Creswell, J.W. (2008). *Research design: qualitative, quantitative, and mixed methods approaches* (3rd ed.). Los Angeles, London, New Delhi, Singapore: SAGE Publications.

- Cho, G.H., Rodríguez, D. & Evenson, K. (2011). Identifying walking trips using GPS data. *Medicine & Science in Sports & Exercise*, 43(2), 365–372.
- Choi, E. (2012). *Walkability as an urban design problem, understanding the activity of walking in the urban environment*. Ph.D. thesis, KTH Royal Institute of Technology, Stockholm.
- Clifton, K.J., Livi Smith, A. D., & Rodriguez, D. (2007). The development and testing of an audit for the pedestrian environment. *Landscape and Urban Planning*, 80(1-2), 95-110.
- Cubukcu, E., Hepguzel, B., Onder, Z., & Tumer, B. (2015). Active living for sustainable future: a model to measure “Walk Scores” via Geographic Information Systems”. *Procedia-Social and Behavioral Sciences*, 168, 229-237.
- Day, K., Boarnet, M., Alfonzo, Mariela., & Forsyth, A. (2006). The Irvine Minnesota inventory to measure the built environments development. *American Journal of Preventive Medicine*, 30(2), 153-159.
- Duncan, M. J. & Mummery, W. K. (2007). GIS or GPS? A comparison of two methods for assessing route taken during active transport. *American Journal of Preventive Medicine*, 33(1), 51–53.
- Elgethun, K., Yost, M. G., Fitzpatrick, C. T. E., Nyerges, T. L., & Fenske, R. A. (2007). Comparison of global positioning system (GPS) tracking and parent-report diaries to characterize children’s time-location patterns. *Journal of Exposure Science and Environmental Epidemiology*, 17(2), 196-206.
- Emery, J., & Crump, C. (2003). *The WABSA Project: assessing and improving your community’s Walkability & Bikeability*. Chapel Hill: Department of Health

Behavior and Health Education School of Public Health, Retrieved April 25, 2020, from <http://wabsa.web.unc.edu/>.

Eurostat. (2021). *The EU in the world-population*, Retrieved February 25, 2021, from https://ec.europa.eu/eurostat/statisticsexplained/index.php/The_EU_in_the_world_-_population.

Ewing, R., & Handy, S. (2009). Measuring the unmeasurable: urban design qualities related to Walkability. *Journal of Urban Design*, 14(1), 65-84.

Forsyth, A. (2015). What is a walkable place? The walkability debate in urban design. *Urban Design International*, 20(4), 274-292.

Forsyth, A., Hearst, M., Oakes, J.M., & Schmitz, H. (2007). Design and destinations: factors influencing walking and total physical activity. *Urban Studies*, 45(9), 1973-1996.

Forsyth, A., & Southworth, M. (2008). Cities afoot—pedestrians. *Walkability and Urban Design*, 13(1), 1-3.

Gehl, J. (2010). *Cities for people*. Washington: Island Press.

Gros, F. (2019). *Marcher une philosophie*. Paris : Champs essais.

Guhathakurta, S., Panguluru, M .K., Sivakumar, & R., Zhang, G. (2013). Walk route: a new methodology to find the optimal walking route in the city of Atlanta. *Planning Support Systems for Sustainable Urban Development*, 309-325.

Guthold, R., Stevens, A. G., Miley, M.Leanne., & Bull, C.Fiona. (2018). Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1,9 million participants. *The Lancet Global Health*, 6(10), 1077 -1086.

- Hall, C. M., & Ram, Y. (2018). Walk score (R) and its potential contribution to the study of active transport and walkability: a critical and systematic review. *Transportation Research Part D: Transport and Environment*, 61, 310-324.
- Handy, L. S., Boarnet, M. G., Ewing, R., & Killingsworth, R. E. (2002). How the built environment aspects physical activity: views from urban planning. *American Journal of Preventive Medicine*, 23(S2), 64-73.
- Hill, M. R. (1984). Stalking the urban pedestrian: a comparison of questionnaire and tracking methodologies for behavioral mapping in large-scale environments. *Environment and Behavior*, 16(5), 539-550.
- Hess, P. & Moudon, A. (1999). Site design and pedestrian travel. *Transportation Research Record: Journal of the Transportation Research Board*, 1674, 9–19.
- IZKA. (2012). Izmir regional plan 2014 – 2023. *Izmir Development Agency (IZKA)*, Retrieved February 25, 2021, from <https://www.izka.org.tr/>.
- Jacobs, A. B. (1993). *Great Streets*. Cambridge, Mass: MIT Press.
- Kang, B., Moudon, A. V., Hurvitz, P. M., Reichley, L., & Saelens, B. E. (2013). Walking objectively measured: classifying accelerometer data with GPS and travel diaries. *Medicine & Science in Sports & Exercise*, 45, 1419-1428.
- Kim, H. (2015). Walking distance, route choice, and activities while walking: a record of following pedestrians from transit stations in the San Francisco Bay area. *Urban Design International*, 20(2), 144–157.
- Lee, C., & A. V. Moudon. (2006). Correlates of walking for transportation or recreation purposes. *Journal of Physical Activity and Health*, 3(1), 77-98.

- Lo, R. H. (2009). Walkability: what is it?. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 2(2), 145-166.
- Marchand, B. (1974). Pedestrian traffic planning and the perception of the urban environment: a French example. *Environment and Planning A*, 6(5), 491-507.
- Mensi, B., & Cubukcu, E. (2019). Walkability: measuring the pedestrian experience. *Livable Environments and Architecture International Congress. Replacing Architecture, September 25-28, 2019, Trabzon, Turkey*, 6, 861-874.
- Merriam-Webster Dictionary. (2015). *Walkable*, Retrieved April 25, 2020, from <https://www.merriam-webster.com/>.
- Moiseeva, A. & Timmermans, H. (2010). Imputing relevant information from multi-day GPS tracers for retail planning and management using data fusion and context-sensitive learning. *Journal of Retailing and Consumer Services*, 17(3), 189–199.
- Moudon, A. V., Lee, C., Cheadle, A. D, Garvin, C., Johnson. D, Schmid, T.L., et al. (2006). Operational definitions of walkable neighborhood: theoretical and empirical insights. *Journal of Physical Activity and Health*, 3(1), 99-117.
- Lautso, K. & Murole, P. (1974). Study of pedestrian traffic in Helsinki: methods and results. *Traffic Engineering and Control*, 15(9), 446-449.
- Oxford English Dictionary. (2020). *Walkable*, Retrieved 25, 2020, from <https://www.oed.com/>.
- Oxford English Dictionary. (2020). *Pedestrian*, Retrieved April, 25, 2020, from <https://www.oed.com/>.
- Oxford English Dictionary. (2020) *Walker*, Retrieved April, 25, 2020, from <https://www.oed.com/>.

- Park, S. (2008). *Defining, measuring and evaluation path Walkability, and testing its impacts on transit users' mode choice and walking distance to the station*. Phd Thesis, University of California, Berkeley.
- Paz-Soldan, V. A., Reiner, R. C., Jr, Morrison, A. C., Stoddard, S. T., Kitron, U., Scott, T. W., et al. (2014). Strengths and weaknesses of global positioning system (GPS) data-loggers and semi-structures interviews for capturing fine-scale human mobility: findings from Iquitos, Peru. *PLoS Neglected Tropical Diseases*, 8(6), e2888.
- Pikora, T.J, Bull, F. C., Jamrozik, K., Knuiman, M., Giles-Corti, B., & Donovan, R.J. (2002). Developing a reliable audit instrument to measure the physical environment for physical activity. *American Journal of Preventive Medicine*, 2002(23), 187-194.
- Pikora, T., Giles-Corti, B., Bull, F., Jamrozik, K., & Donovan, R. (2003). Developing a framework for assessment of the environmental determinants of walking and cycling. *Social Science and Medicine*, 56(8), 1693-1703.
- Pushkarev, B. S. & Zupan, J. M. (1975). *Urban Space for Pedestrians* Cambridge, MA: MIT Press.
- Saelens, E. B., & Handy. L.S. (2008). Built environment correlates of walking: a review. *Medicine Science in Sports Exercise*, 40(7), 550-566.
- Saelens, E. B., Sallis, F. J., & Frank, D. L. (2003). Environmental correlates of walking and cycling: Findings from the transportation. *Urban Design and Planning Literatures. Behavioral Medicine*, 25(2), 80-91.
- Sisiopiku, V. & Akin, D. (2003). Pedestrian behaviors at and perceptions towards various pedestrian facilities: An examination based on observation and survey data. *Transportation Research Part F: Traffic Psychology and Behavior*, 6(4), 249–274.

- Shoval, N. & Isaacson, M. (2006). Application of tracking technologies to the study of pedestrian spatial behavior. *The Professional Geographer*, 58(2), 172–183.
- Shoval, N., Isaacson, M., & Chhetri, Pr. (2014). GPS, smartphones, and the future of tourism research. *The Wiley Blackwell Companion to Tourism*, 251-261.
- Solnit, R. (2001). *Wanderlust: a history of walking*. New York: Penguin Books.
- Southworth, M. (2005). Designing the walkable city. *Journal of Urban Planning and Development*, 131(4), 246-257.
- Speck, J. (2012). *Walkable city*. New York: Farrar, Strauss and Giroux.
- Suminski, R.R. & Petosa, R.L. (2006). An observation method for determining the number of children and adults walking/biking to elementary school. *Journal of Physical Activity and Health*, 3(1), 37–47.
- Talen, E., & Koschinsky, J. (2013). The walkable neighborhood: a literature review. *International Journal of Sustainable Land Use and Urban Planning*, 1(1), 42-63.
- Tudor-Locke, C., Lee, S.M., Morgan, C.F., Beighle, A., & Pangrazi, R.P. (2006). Children's pedometer-determined physical activity during the segmented school day. *Medicine Science in Sports Exercise*, 38(10). 1732-1738.
- United Nations, Department of economic and social affairs, Population division. (2019). *World Urbanization Prospects: The 2018 Revision* (ST/ESA/SER.A/420). New York: United Nations.
- Walk score. (2020). *Walkscore*, Retrieved April 25, 2020, from <https://www.walkscore.com/>.

- Weiss, R. & Boutourline, S. (1962). *Fairs. Exhibits. Pavilions and Their Audiences*. New York: IBM corporation.
- Wiehe, S.E., Carroll, A.E., Liu, G.C., Haberkom, K.L., Hoch, S.C., Wilson, J.S., et al. (2008). Using GPS-enabled cell phones to track the travel patterns of adolescents. *International Journal of Health Geographics*, 7(22), 1–11.
- Winters, M. Brauser, M., Setton, E. M., & Teschke, K. (2010). Built environment influences on healthy transportation choices: bicycling versus driving. *Journal Urban Health*, 87(6), 969-993.
- Wolf, J. & Guensler, R. (2001). Elimination of the travel diary: experiment to derive trip purpose from global positioning system travel data. *Transportation Research Record. Journal of the Transportation Research Board*, 1768(1), 125–134.
- Yin, R.K. (2008). Case study research: design and methods. *Applied Social Research Methods* (4th ed.). Thousand Oaks, CA: Sage.
- Zacharias, J. & Zhao, Q. (2018). Local environmental factors in walking distance at metro stations. *Public Transport*, 10(1), 91–106.

APPENDICES

- Id :130010, September 16, 2019 Monday at 13:00:10 from K1

A tracked walking trip starting from the observation point K1 in Zone K. She was an adult who was wearing casual clothes and walking with her daughter (a child of 6-8 years old). They were talking and holding hands all the way. They only used pedestrian streets, which wasn't the shortest distance. They were walking fast and passing by other pedestrians. She dropped her daughter to school. Then, she met a lady of her age who seems to be the mother of her daughter's friend at school. She walked with that lady together with a slower speed. Other people around them were also walking moderate to slow speed. They were talking to each other all the way. The observation ended while she was walking.

- Id :131726, September 16, 2019 Monday at 13:17:26 from K1

A tracked walking trip starting from the observation point K1 in Zone K. She was an adult who was wearing sport clothes. She was walking alone and fast and passing other people. During the observation period the street was crowded. She didn't look around. She seems to know the place very well. She was looking for something to buy. She only used the pedestrian street.

- Id :101842, September 17, 2019 Tuesday at 10:18:42 from K1

A tracked walking trip starting from the observation point K1 in Zone K. She was a young woman wearing casual clothes who was walking with her friend/sister/colleague. They were walking fast at first. They stopped in the middle of the street, as if they were looking for a place or someone to meet. And then continued walking on a moderate speed. During their walk, they sometimes stop and chat in the middle of the sidewalk. The street at that time wasn't crowded. She didn't pay attention to the surrounding environment.

- **Id :130027, September 20, 2019 Tuesday at 13:00:27 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was a young woman wearing casual clothes. She seems to know the place very well and her destination was clear. She used the shortest path. She was holding her phone, alone and she was walking fast. The area “Karsiayaka Carsi” was crowded, full of people and activities. During the walk she passed many other people and people passed by her too.

- **Id :131525, September 17, 2019 Tuesday at 13:15:25 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was a woman, adult and wearing casual clothes. At first she was alone, walking on a slow speed. Then she met a young girl and walked together with her. She was walking on the left side of the pedestrian street and as the street was crowded her walk was interrupted by many other people who are walking in the opposite direction. They were together but they didn’t walk side by side, the younger girl was faster than the older one During the observation period the street was crowded. They entered a grocery shop, then a specialized retail shop.

- **Id :130110, September 18, 2019 Wednesday at 13:01:10 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was a 6-8 years’ child walking with her father and a dog. They talked to each other all the way. They were walking on a moderate speed. Instead of the main pedestrian street (which is crowded), they took a less crowded street. The path they chose seems to be the shortest path between start point and final destination. They used the sidewalk, waited for the cars at the intersection points and at the shared road (pedestrian and cars), they were very attentive and used the separation dedicated for pedestrians.

- **Id :132735, September 18, 2019 Wednesday at 13:27:35 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was an adult woman wearing casual clothes. She was walking on the left in crowded street (opposite to other people). She was trying to walk under the shadow. She took the main pedestrian street in the area. She was walking a moderate speed, almost at the

same speed with other pedestrians in the area. She was window shopping to boutiques along the path and she tend to pay attention to buildings and surrounding environment.

- **Id :175331, September 18, 2019 Wednesday at 17:53:31 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. He was an adult who was wearing casual clothes. The area was full of people. At first he was walking along the pedestrian street, then he used the sidewalk as much as possible. He was giving priorities to other pedestrians and cars. He was at first walking on moderate speed then, he slow down, especially when he was looking to boutiques and the surrounding area. He didn't use the shortest path. He rested in a park.

- **Id :100337, September 20, 2019 Thursday at 10:03:37 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was an elderly woman who was wearing casual clothes. She was with her son. They were together all the way and talking to each other. They entered three different grocery places. They were walking on a moderate speed all the way. The area was empty at that time. They seem to know the place.

- **Id :101650, September 19, 2019 Thursday at 10:16:50 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. He was an adult who was wearing casual clothes. He was walking on a moderate speed. He used the most common main pedestrian street in the area, which wasn't the shortest path to take. The street was almost empty at that time. He was walking and looking around. He stopped in a café.

- **Id :130016, September 19, 2019 Thursday at 13:00:16 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. He was an adult who was wearing casual clothes. At first, he was walking on moderate speed in the pedestrian area. He was passing by people in the street. He stopped by a shopping place. Then continued walking on a slow speed. At the intersection point, between the pedestrian area and the car road, he waited for cars to cross the street. He was walking

on a slow speed and started using the sidewalk. He used the most common main pedestrian street in the area, which wasn't the shortest path to take.

- **Id :133229, September 19, 2019 Thursday at 13:32:29 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was a woman, adult, wearing casual clothes and holding a phone; She was with her husband. At the beginning of "Kemal Pasa Street", there was a dance show. She stopped by the show, enjoyed the show, took a video and then continued walking. She didn't walk all the way with her husband, side by side. She was in her phone, talking and chatting. She was more on her phone, than enjoying the street. She entered a bank.

- **Id :101232, September 20, 2019 Friday at 10:12:32 from K1**

A tracked walking trip starting from the observation point K1 in Zone K. She was young woman who was wearing casual clothes, high heels and holding two bags. She was walking on a moderate speed. Most of people present at that time were walking on the same speed. At first, she was walking in the middle of the pedestrian street "Kemal Pasa Street" that relates the Karsiyaka ferry boat station to the Karsiyaka Izban station. She entered a simit place and went out after buying something to eat. Later, she got a phone call. At that time, she was trying to cross the street but a truck (camion) blocked her and didn't let her to pass. She dropped off the sidewalk, walked a bit on the traffic road and then used the sidewalk once again. While walking, she faced a first obstacle: an electric pole, then a carpet in a bad condition, so she decided to drop off the sidewalk and kept on looking on the traffic street to check if a car is coming. The observation ended while she was walking.

- **Id :104844, September 16, 2019 Monday at 10:48:44 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was an elderly woman who was wearing casual clothes. She only used the sidewalk. Even though, the sidewalk was narrow. Most people on that area do use the sidewalk, because the road was crowded. Sometimes, when the sidewalk wasn't enough for 2 to 3 people, she resisted and didn't drop from the sidewalk. She entered to 3 shops and

did a lot of window shopping, which wasn't planned (seems). She was looking around all the way, looking to boutiques, people.

- Id :110604, September 16, 2019 Monday at 11:06:04 from K2

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man who was wearing casual clothes and smoking. He used the main pedestrian street that relates the "Karsiyaka Izban station" and "dolmus station" to "Karsiyaka ferry boat station" and "tramway station". He was fast, walking only at the right side of the street, the street wasn't crowded at that time. He passed other people. When he needs to cross the streets, he didn't use the crossing path.

- Id :134228, September 16, 2019 Monday at 13:42:28 from K2

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man, who was wearing casual clothes. He started walking, stopped by a first place, continued walking, get a juice and then turned back. He was looking around all the way, as if he is discovering the place. He was walking on slow speed. He doesn't seem from the area. The used path was an only pedestrian street. It was crowd of people at that time and the weather was nice. The observation ended while he was walking.

- Id :103110, September 17, 2019 Tuesday at 10:31:10 from K2

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man who was wearing casual clothes. He seems to be from the area. He greeted many people on that area and he met and talked to three people. He entered to two grocery places and a café.

- Id :105428, September 17, 2019 Tuesday at 10:54:28 from K

A tracked walking trip starting from the observation point K2 in Zone K. He was an elderly man who was wearing casual clothes. He entered a bank, then continued walking. He was looking around the place, some boutiques, buildings, they were fruits, books exposed at that area. He was walking on slow speed; the street was almost empty. The 10 minutes finished while she was walking.

- **Id :133002, September 17, 2019 Tuesday at 13:30:02 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man who was wearing casual clothes. He stopped at two points. He used the shortest path. He walked on a moderate speed all the time. The path he followed was less crowded than the main pedestrian street street "Kemal Pasa Street". The observation ended while he was walking.

- **Id :135550, September 17, 2019 Tuesday at 13:55:50 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man who was wearing casual clothes. He was walking with his wife, all the way together and they were holding each other. They were talking and enjoying being in the area. They walked on a moderate speed, which was almost the same speed at the area at that time. They entered a bank and a public toilet.

- **Id :103103, September 18, 2019 Wednesday at 10:31:03 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was an elderly man wearing casual clothes. He was fast at first, then started walking on moderate speed. He didn't interact with the surrounding environment. He was walking directly to his destination. He entered a bank. Actually, at that time the street was almost empty. A car entered the area, so he waited then then continued walking.

- **Id :105016, September 18, 2019 Wednesday at 10:50:16 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man, who was wearing casual clothes. He stopped two times to shop and once to greet and talk to someone (friend). He knows many people from the area; he greeted more than one time. At first, he started walking on the pedestrian street, then he used the road, which was almost empty, the sidewalk at that area wasn't wide enough. The path he used wasn't the shortest path. He used the more common street with direct paths. He was holding his phone and talked once on the phone.

- **Id :134348, September 18, 2019 Wednesday at 13:43:48 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was young. He started walking on a moderate speed, then got a phone call and started walking slowly. One time he passed by some people who were very slow. He walked in the crowd.

- **Id :135952, September 18, 2019 Wednesday at 13:59:52 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult man, who was wearing casual clothes, with his son. They were holding hands and talking. He was looking for their destination, he was looking right and left till he found the place. He walked on a moderate speed. It was peak time; the street was crowd.

- **Id :102854, September 19, 2019 Thursday at 10:28:54 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was young who was wearing casual clothes. She was walking on a moderate speed. She let people pass by her. It was early in the area and it was empty. She entered a restaurant.

- **Id :104729, September 19, 2019 Thursday at 10:47:29 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was a man, adult man and wearing casual clothes. At first he was walking on a moderate speed, till he met his friend and started walking together on slow speed. They were talking all the way, looking around and showing buildings.

- **Id :131614, September 19, 2019 Thursday at 13:16:14 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was a young woman, walking on moderate speed in the crowd. She was walking on the left side of the street, in the opposite direction of pedestrians, the side where she can shop. She entered to two shops. She was shopping and looking to boutiques. The observation ended while she was walking.

- **Id :134630, September 19, 2019 Thursday at 13:46:30 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was adult woman, walking on a moderate speed. She walked at left under the shade of buildings, while people are walking at right. The observation ended while she was walking.

- **Id :102831, September 20, 2019 Friday at 10:28:31 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was a woman and adult. She was on her phone all the way. She was slow. She was walking according to the speed of the pedestrians at that time. She bought something to eat, then entered a café place.

- **Id :104914, September 20, 2019 Friday at 10:49:14 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. He was an adult. At first, he was fast and after reaching his first destination, she slowed down and walked on a moderate speed. The street wasn't crowded, but still he was passing pedestrians. He was just looking around. The observation ended while he was walking.

- **Id :132627, September 20, 2019 Friday at 13:26:27 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was an adult who was wearing casual clothes. At first, she was fast at first, then and after reaching her first point, she walked on a moderate speed. She walked on the main pedestrian street instead of parallel roads which was the shortest, the path was a more common used street and the main one in the area. She didn't cross at intersection point. The observation ended while she was walking.

- **Id :134322, September 20, 2019 Friday at 13:43:22 from K2**

A tracked walking trip starting from the observation point K2 in Zone K. She was a young woman walking with her family. They were 4 members of her family. They walked 2 by 2, she was with her dad, while her sister was with her mother. She was holding her father's hand and talking all the way and walked on a moderate speed. The family socially interact together. They met someone, talked for 1 to 2 minutes then

continued walking. They walked in the crowd. They passed people, and people passed them.

- Id :112030, September 16, 2019 Monday at 11:20:30 from K3

A tracked walking trip starting from the observation point K3 in Zone K. He was a young man who was wearing casual clothes. He seems to be from the area. He was walking on a moderate speed on the pedestrian street, which was the only alternative. At that time, people started coming to the area. He greeted someone. He entered a restaurant and bought something to eat. And entered a retail office twice.

- Id :113318, September 16, 2019 Monday at 11:33:18 from K3

A tracked walking trip starting from the observation point K3 in Zone K. He was an adult man, who was wearing casual clothes. He was walking on a moderate speed. He entered a bank then a shop. While crossing the street, he waited for cars to cross the street. At first, he walked at the pedestrian street, then he didn't use the sidewalk. The path that he used was the shortest. At that time, the road wasn't crowded. He threw in the trash can. The observation ended while she was walking.

- Id :171021, September 16, 2019 Monday at 17:10:21 from K3

A tracked walking trip starting from the observation point K3 in Zone K. She was an elderly woman, walking with her friend/ sister of her age on a slow speed. They were talking while they were shopping. They checked more than one shop: Sometimes, they just got a look at some boutiques without entering. They seem to know the place and they were looking for something to buy. Shops that they entered are selling the same products. They were walking on the pedestrian area, sometimes at the right side of the street, sometimes at the left side. The street was crowded and people were passing them. The observation ended while she was walking.

- Id :111359, September 17, 2019 Tuesday at 11:13:59 from K3

A tracked walking trip starting from the observation point K3 in Zone K. She was an elderly woman who was wearing casual clothes and holding a walking cane. She was walking with a woman (friend/ daughter/ sister) on a slow speed. They were

talking together all the way and holding hands. At that time, the street wasn't yet crowded. They were shopping, window shopping and looking to the surrounding environment. They seem to enjoy their path.

- Id :172516, September 17, 2019 Tuesday at 17:25:16 from K3

A tracked walking trip starting from the observation point K3 in Zone K. She was an adult woman walking fast. At first, she was walking on the pedestrian street. The street was crowded at that time. Then, she started walking on a moderate speed on the road. She only used the sidewalk for a couple of times. The sidewalk wasn't wide enough and the road wasn't crowded: it was wide to let a pedestrian and a car fit together. She shopped from a supermarket and continued walking. The observation ended while she was walking.

- Id :111005, September 18, 2019 Wednesday at 11:10:05 from K3

A tracked walking trip starting from the observation point K3 in Zone K. He was an adult man, walking alone and on a moderate speed. He used the sidewalk. In front of a café shop, there were chairs, so he decided to drop off the sidewalk and continued walking on the road, till a car came and used the sidewalk once again. He entered the park to cross to the other area. Actually, he didn't used the shortest path. The used path was the diagonal.

- Id :111748, September 19, 2019 Thursday at 11:17:48 from K3

A tracked walking trip starting from the observation point K3 in Zone K. She was a child, walking fast. While crossing the street, she was very attentive and waited for cars before crossing.

- Id :172332, September 19, 2019 Thursday at 17:23:32 from K3

A tracked walking trip starting from the observation point K3 in Zone K. He was an adult man who was wearing casual clothes and holding shopping bags. He was fast. He started walking at the pedestrian street, then and after going out of the pedestrian area, he used the sidewalk. The sidewalk was wide enough to walk. He crossed the street after letting other cars to pass.

- Id :111956, September 20, 2019 Friday at 11:19:56 from K3

A tracked walking trip starting from the observation point K3 in Zone K. She was a young woman, walking on slow speed. She was alone and was looking to the surrounding environment. At that time, the street wasn't crowded. It was easy to move from right to left on the street.

- Id :171352, September 20, 2019 Friday at 17:13:52 from K3

A tracked walking trip starting from the observation point K3 in Zone K. She was an adult woman, walking on the pedestrian area. At that time, the area was crowded. She was walking on moderate speed and passing people. She seems to be going back home.

- Id :115526, September 16, 2019 Monday at 11:55:26 from K4

A tracked walking trip starting from the observation point K4 in Zone K. He was an adult man, walking on a moderate speed. He was walking on the road and sometimes the sidewalk. They weren't cars on the road. While crossing, he didn't wait for the traffic light to turn green.

- Id :173704, September 16, 2019 Monday at 17:37:04 from K4

A tracked walking trip starting from the observation point K4 in Zone K. He was an adult man walking on a moderate speed. He didn't use the sidewalk. The area was crowded. The observation finished while he was walking.

- Id :175806, September 16, 2019 Monday at 17:58:06 from K4

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman, walking with someone. They were talking. Later, she met someone and they talked for one minute, she seems to be from the area. At first, she used the road and stand between parked cars to let cars pass. The observation ended while she was walking.

- Id :113540, September 17, 2019 Tuesday at 11:35:40 from K4

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman, walking on a moderate speed. She was walking on the road; there is no car. Most people on that area walk on the road. The sidewalk is narrow. While she was walking, she stopped in front of a building and waited for some minutes. Her friend came out the building and started walking together and talking. They continued walking on the road until they reached a primary road “crowded” with a wide sidewalk, then they used the sidewalk. The observation finished while she was walking.

- Id :115331, September 17, 2019 Tuesday at 11:53:31 from K4

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman, walking on a moderate speed. During her walk, she started walking on the road till she reached the pedestrian area. The path used wasn't the shortest path. She entered a shop (perfume shop).

- Id :174946, September 17, 2019 Tuesday at 17:49:46 from K4

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman, walking on a slow speed. She used the road, only at one time when a motorcycle came and used the sidewalk for some time, then dropped to the road. The path that he used wasn't the shortest. During her walk, she greeted many people. She seems to be from the area. The observation ended while she was walking.

- Id :112708, September 18, 2019 Wednesday at 11:27:08 from K4

A tracked walking trip starting from the observation point K4 in Zone K. He was an adult man. He was on his phone all the time, he stopped several times to check his phone. He was walking on the road. At the commercial street where the sidewalk was wide, she used the sidewalk. The observation ended while she was walking.

- **Id :114653, September 18, 2019 Wednesday at 11:46:53 from K4**

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman, walking on a moderate speed. She was shopping, window shopping and looking around the surrounded environment. Most of the time, she used the sidewalk. At that time, the street wasn't crowded. While some people was walking on the road, others was walking the sidewalk. She entered a supermarket.

- **Id :174118, September 18, 2019 Wednesday at 17:41:18 from K4**

A tracked walking trip starting from the observation point K4 in Zone K. He was an elderly man who was wearing casual clothes and walking on a moderate speed. While he was walking, he was window shopping (boutiques, shops, supermarket ...). At that time, the street was crowd of people. He only used the sidewalk. He passed people and people passed him. The observation ended while he was walking.

- **Id :113320, September 19, 2019 Thursday at 11:33:20 from K4**

A tracked walking trip starting from the observation point K4 in Zone K. He was an adult man walking on a slow speed with a shopping bag. He didn't use the sidewalk at first, but when he came to the main road he used the sidewalk. He seems to be from the area because he greeted people many times. He was shopping. The observation ended while she was walking.

- **Id :174146, September 19, 2019 Thursday at 17:41:46 from K4**

A tracked walking trip starting from the observation point K4 in Zone K. She was a young woman with her friend. While walking, they were talking and shopping (2 shops). They used the sidewalk.

- **Id :114140, September 20, 2019 Friday at 11:41:40 from K4**

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman, with her son (a baby) and walking on a slow speed. She was walking on the road, until she started walking on the pedestrian street. They stopped by a super market to show fruits to her son, then they continued walking. They were talking all

the way. They greeted someone on their road. The observation ended while she was walking.

- Id :173435, September 20, 2019 Friday at 17:34:35 from K4

A tracked walking trip starting from the observation point K4 in Zone K. She was an adult woman. Most of the time, she was fast and at some points she was walking on a moderate speed. She used the sidewalk at first, then walked on the pedestrian street. She used a direct path. While walking, she window shopped. The observation ended while she walking.

- Id :141120, September 16, 2019 Monday at 14:11:20 from K5

A tracked walking trip starting from the observation point K5 in Zone K. He was an adult man who was wearing casual clothes and holding shopping bags. He was walking on a moderate speed. One time, she stopped to rest. He was walking on the road, even though the sidewalk was empty, he even let a car pass him and continued walking. Even though the sidewalk is not enough for more than 2 people, he didn't used the sidewalk.

- Id :165125, September 16, 2019 Monday at 16:51:25 from K5

A tracked walking trip starting from the observation point K5 in Zone K. He was an adult man who was wearing casual clothes and holding a phone. At that time, the street was crowd. He was walking on a moderate speed and used the pedestrian street. He entered a shop, then continued walking. He was looking around the surrounding environment. The observation ended while he was walking.

- Id :164924, September 17, 2019 Tuesday at 16:49:24 from K5

A tracked walking trip starting from the observation point K5 in Zone K. He was an adult man who was wearing casual clothes. During his trip, he only used the sidewalk. He was looking around the surrounding environment. He was walking on a slow speed. The path was the shortest. He entered a supermarket at first, then an apartment.

- **Id :165817, September 18, 2019 Wednesday at 16:58:17 from K5**

A tracked walking trip starting from the observation point K5 in Zone K. He was an adult man who was wearing casual clothes. He walking on a moderate speed, then on slow speed. At first, he used the sidewalk, then walked on the pedestrian street. It wasn't the shortest path. He momentarily talked on his phone.

- **Id :140235, September 19, 2019 Thursday at 14:02:35 from K5**

A tracked walking trip starting from the observation point K5 in Zone K. She was an adult woman who was wearing casual clothes with her dog. She was walking on a moderate speed. When her dog took on a wrong path, she waited for it. She greeted many people from the area. Her path was clear, going back to her apartment.

- **Id :164413, September 19, 2019 Thursday at 16:44:13 from K5**

A tracked walking trip starting from the observation point K5 in Zone K. She was an adult woman who was wearing casual clothes. She was walking on a moderate speed. She used the pedestrian street. The street was crowded; that's why she was she was passing people. She seems to be looking for something to buy, because she was entered many boutiques where they sell the same thing.

- **Id :141502, September 20, 2019 Friday at 14:15:02 from K5**

A tracked walking trip starting from the observation point K5 in Zone K. He was an adult man, wearing casual clothes and holding fishing bag and accessories. He doesn't look from the area and he seems to go to the sea coast. He was walking on the sidewalk, and dropped once to let a baby-stroller pas. The sidewalk was narrow at that area and the traffic road was empty. He seems that he doesn't know the place. He didn't use the shortest path. He was looking around and even stopped by a shop to look. The 10 minutes finished while he was walking.

- **Id :165803, September 20, 2019 Friday at 16:58:03 from K5**

A tracked walking trip starting from the observation point K5 in Zone K. He was an adult woman, walking on slow speed with her dog. She entered a shop. She was walking on the pedestrian area. It wasn't the short path.

- Id :143141, September 16, 2019 Monday at 14:31:41 from K6

A tracked walking trip starting from the observation point K6 in Zone K. She was a woman who was wearing casual clothes with her friend/ sister. They were walking on the sidewalk as much as possible. But at a certain point, her friend/sister dropped off the street because it was narrow, so she followed her and they were walking on the road. The road was empty and no cars coming. They were talking while walking. Before entering the pedestrian zone, the traffic road was full of cars, so they used the sidewalk. And entered cosmetic and beauty shop (Rossman).

- Id :144917, September 16, 2019 Monday at 14:49:17 from K6

A tracked walking trip starting from the observation point K6 in Zone K. He was walking alone and slow. He was only at the last part walking on the sidewalk. At that part, the sidewalk was very narrow, and the road was a secondary road in a residential area. The path he used was the shortest path.

- Id :160845, September 16, 2019 Monday at 16:08:45 from K6

A tracked walking trip starting from the observation point K6 in Zone K. She was an adult woman who was wearing casual clothes. She was fast. Even though the sidewalk was narrow, she was walking on the sidewalk. She let people pass her. When he answered his phone, she was walking on a moderate speed. Later, she met her mother and continued walking on a moderate speed. They didn't use the shortest path.

- Id :144615, September 17, 2019 Tuesday at 14:46:15 from K6

A tracked walking trip starting from the observation point K6 in Zone K. He was an elderly man who was wearing casual clothes. He was fast. At first, he didn't walk on the sidewalk. Then he was walking on the pedestrian area and passing by people. The path was the shortest path.

- **Id :144249, September 18, 2019 Wednesday at 14:42:49 from K6**

A tracked walking trip starting from the observation point K6 in Zone K. He was an elderly man who was wearing casual clothes. He was walking on a moderate speed. At first, he was walking on the sidewalk. Then, he was walking on the pedestrian area. He was passing people. Only on one case, he used the road instead of the sidewalk, which was the case of most people of that area. The road wasn't crowded (no cars). He talked on the phone momentarily. The path he used was the shortest path.

- **Id :160823, September 18, 2019 Wednesday at 16:08:23 from K6**

A tracked walking trip starting from the observation point K6 in Zone K. He was a child walking with his mother and he was holding her hand. They were walking on a moderate speed. They were talking all the way. They didn't take the shortest path. The path who used was a non-direct path and less crowded (cars). They most often were walking on the sidewalk. When crossing the street, they checked and crossed the street. Before coming to their destination, he met his friends from the area, stopped, talked, then continued walking.

- **Id :162708, September 18, 2019 Wednesday at 16:27:08 from K6**

A tracked walking trip starting from the observation point K6 in Zone K. She was a young woman who was wearing a school uniform and a backpack with her friend. She was walking on a moderate speed. She was walking as much as possible on the sidewalk. When crossing the street, they waited for the cars to pass first. Actually, most people don't wait for the lights to turn green. At one point, they dropped from the sidewalk to pass other pedestrians. The observation ended while he was walking.

- **Id :161604, September 19, 2019 Thursday at 16:16:04 from K6**

A tracked walking trip starting from the observation point K6 in Zone K. He was an adult man who was wearing casual clothes and holding a suitcase. He was walking

on slow speed. He was walking on the sidewalk as much as possible. While walking, he faced 4 obstacles: two electric pole, a tree and a site construction. Before crossing the street, he checked the road. He greeted someone. The observation ended while he was walking.

- Id :143312, September 20, 2019 Friday at 14:33:12 from K6

A tracked walking trip starting from the observation point K6 in Zone K. He was an adult man. He was walking on a moderate speed. He was walking on the sidewalk as much as possible, like most people of that area. He dropped from the sidewalk because of a construction site.

- Id :144934, September 20, 2019 Friday at 14:49:34 from K6

A tracked walking trip starting from the observation point K6 in Zone K. She was a young woman who was wearing casual clothes. She was fast. She was walking on the street like most people of the area. Well, the sidewalk was wide enough for 2 people and there were some cars on the street. She was giving priorities to cars. The path he used wasn't the shortest path, but it was a less crowded, compared to the main and direct roads that goes to her destination. She entered to the boutique before the 10 minutes.

- Id :162626, September 20, 2019 Friday at 16:26:26 from K6

A tracked walking trip starting from the observation point K6 in Zone K. She was a young woman who was wearing casual clothes. During her walk, she was walking on the sidewalk. Actually, the sidewalk was narrow and enough for 2 to 3 people. Most people on that area was walking on the sidewalk. At first she was fast, then walked on a moderate speed. While walking, she checked her phone many times. At road intersections, she crossed the street easily. Later, she talked on the phone. The observation finished while she was walking.

- **Id :101501, September 30, 2019 Monday at 10:15:01 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman who was wearing casual clothes and walked on a moderate speed. She entered in the park, set in the bench for 3 minutes, then she continued walking. Most people on that area, used the park to cross to the other side. She was walking on the sidewalk. At that time, the street wasn't crowded and crossing the road was easy.

- **Id :103304, September 30, 2019 Monday at 10:33:04 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was a young woman who was wearing casual clothes. She was walking on the sidewalk, the sidewalk was wide enough for more than 3 people at first, then narrow sidewalk and empty road. She was wearing high heels; the quality of sidewalk wasn't comfortable. She was walking on a moderate speed. She entered a shop and an apartment.

- **Id :130625, September 30, 2019 Monday at 13:06:25 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman. She was walking on the sidewalk. She entered a grocery shop and restaurant.

- **Id :132144, September 30, 2019 Monday at 13:21:44 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. He was a young man with his friend. He was walking on the sidewalk. He was checking his phone and talking. He was walking on a moderate speed. He entered in a grocery shop. The observation finished while he was walking.

- **Id :130759, October 01, 2019 Tuesday at 13:07:59 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. He was a young man walking at a moderate speed. He was walking on the sidewalk. On that area, the sidewalk was wide and most people walk on the sidewalk. While crossing, he didn't wait the traffic light to turn red to cross the street. He entered in a market and an apartment.

- **Id :132207, October 01, 2019 Tuesday at 13:22:07 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman with her friend. They were walking on the sidewalk. At that area, most people do walk on the sidewalk. It is a main road in the area with wide sidewalks. They were talking. After some meters, they separated from each other. This time, she was walking on the road. It is a more residential area with narrow sidewalk. She entered an apartment.

- **Id :133332, October 01, 2019 Tuesday at 13:33:32 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. He was an adult man with a friend/ brother. He was walking on the sidewalk. He crossed the street in the middle of the street to reach the other side of the street. He entered a bank and a restaurant.

- **Id :102027, October 02, 2019 Wednesday at 10:20:27 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman. She started walking in the park, then was walking on the sidewalk. She was walking at a moderate speed and passing people. In the pedestrian area, she slowed down and enjoyed the surrounding environment. She crossed at the green light. She entered in an apartment.

- **Id :130943, October 02, 2019 Wednesday at 13:09:43 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was a young woman. She was walking on the sidewalk. She was fast and passing pedestrians. She checked google maps and followed the direction of her phone (map). So, she didn't look around the surrounding environment. She entered in a café place.

- **Id :132537, October 02, 2019 Wednesday at 13:25:37 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman walking on a moderate speed. Sometimes, she was walking on the sidewalk, sometimes on the road. She used the pedestrian bridge to cross to the other side of the street, she seems to know the place. She entered in a café place.

- **Id :102049, October 03, 2019 Thursday at 10:20:49 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman listening to music. She was walking on the sidewalk as much as possible. She crossed in the middle of the street and was attentive. She entered in an apartment.

- **Id :130624, October 03, 2019 Thursday at 13:06:24 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. He was a young man with his friend. They were walking on the sidewalk. They were talking. The path that they used wasn't the shortest path, but it was a common used road. The observation ended while she was walking.

- **Id :132510, October 03, 2019 Thursday at 13:25:10 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman with her mom and pushing her son/daughter's baby stroller. They

were walking on the sidewalk, like most people of that area. While walking, they were talking. She waited the green light to cross the street. She entered a market.

- **Id :130657, October 04, 2019 Friday at 13:06:57 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. She was an adult woman. She was walking on the sidewalk. She stopped once to check the phone, then continued walking. She was fast. She entered in a market.

- **Id :132543, October 04, 2019 Friday at 13:25:43 from B1**

A tracked walking trip starting from the observation point B1 in Zone B. He was walking on the sidewalk and was crossing at green traffic light. After some meters, he met his friend and decided to join them. He walking on a moderate speed.

- **Id :104545, September 30, 2019 Monday at 10:45:45 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. She was an elderly woman. She was walking at slow speed and on the sidewalk. Most people of that area do used the sidewalk. While walking, she was window shopping, looking around the surrounding environment (buildings, river) ad played with a dog. While crossing, she was running to escape cars. The observation ended while she was walking.

- **Id :133735, September 30, 2019 Monday at 13:37:35 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. He was an adult man. At first, he was walking on the sidewalk. Then, he was walking on the road. The first part, was a main road with wide sidewalk, the second part was a less common area. In the second area, not all people was walking on the road, some of people was walking on the sidewalk, others both sidewalk and road. He entered in a grocery place and a café.

- **Id :105314, October 02, 2019 Wednesday at 10:53:14 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. She was an adult woman holding a shopping bag. At first, she was walking alone, then she met her neighborhood. They were walking to the Pazar. They crossed to the other side to avoid the sun. They were walking on the sidewalk. The observation ended while she was walking.

- **Id :134842, October 02, 2019 Wednesday at 13:48:42 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. She was an adult pushing a special need pushchair. She was walking on the sidewalk. At one point, the ramp was hard the sidewalk was narrow, so pedestrians gave priority. She stopped once to take to rest a bit.

- Id :104130, October 03, 2019 Thursday at 10:41:30 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. She was with her son/daughter on a baby stroller. She was walking on the sidewalk. She crossed the street when there weren't cars on the road. At that time, the area was calm. They were talking.

- **Id :134952, October 03, 2019 Thursday at 13:49:52 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. She was a young woman who was wearing sport clothes. She was walking on the sidewalk. She crossed the street when there weren't cars on the road.

- **Id :105303, October 04, 2019 Friday at 10:53:03 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. She was a young woman. She was walking on the sidewalk. She entered in an apartment.

- **Id :134422, October 04, 2019 Friday at 13:44:22 from B2**

A tracked walking trip starting from the observation point B2 in Zone B. He was a young man, walking on a moderate speed. He was walking on the sidewalk. Most of people on that area were walking on the sidewalk. He entered in a bank. The observation ended while she was walking.

- **Id :111907, September 30, 2019 Monday at 11:19:07 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an adult woman who was wearing sport clothes. She seems that she was going out from the gym or going to the gym. She was walking on the sidewalk. Once, she dropped off the sidewalk because of exposed fruits in front of a market on the sidewalk, then she continued walking on the sidewalk. Most people on that area was walking on the sidewalk too. She stopped two times to check her phone and text back. She was running to cross the road and avoid the coming car. She was walking on a moderate speed. The observation ended while she was walking.

- **Id :172251, September 30, 2019 Monday at 17:22:51 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was a young woman who was wearing causal clothes. She was walking on a moderate speed and on the sidewalk. Once, a car was parking was parking, she dropped off the sidewalk and continued walking on the road. Later, a construction site was on the road, so she started walking on the sidewalk. While walking, she checked a fruit seller and continued walking.

- **Id :111319, October 01, 2019 Tuesday at 11:13:19 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an elderly woman walking on a moderate speed. She was walking on the sidewalk. Once, she dropped off the sidewalk because it was narrow. Not all people on that area

were walking on the sidewalk. She was giving priority to other pedestrians. She entered in the hospital.

- **Id :171538, October 01, 2019 Tuesday at 17:15:38 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an adult woman who was wearing casual clothes. She was walking with her husband/ friend. While walking, they were talking and looking around the surround environment (balconies and buildings). She was walking on a moderate speed and on the sidewalk. A sofa was on the sidewalk, so she dropped off, then continued walking on the sidewalk. She entered in a grocery shop. The observation ended while she was walking.

- **Id :112234, October 02, 2019 Wednesday at 11:22:34 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was a young woman holding shopping bags. She was talking on her phone, but kept on walking fast. She was walking on the sidewalk. Most people of that area were walking on the sidewalk. She entered in a real estate office then an apartment.

- **Id :171439, October 02, 2019 Wednesday at 17:14:39 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an adult woman with her friend/ neighbor. While walking, they were talking. First, she was walking on the sidewalk, then on the traffic road. People were also walking on the road. The sidewalk was narrow and the road was empty. She received a phone call.

- **Id :111627, October 03, 2019 Thursday at 11:16:27 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an adult woman talking on her phone. She was walking on the sidewalk. She was crossing the street in the middle and not at crossing point, which was the case of most people on that area. She entered in a store. I saw her later on the area after the 10 minutes.

- **Id :165755, October 03, 2019 Thursday at 16:57:55 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an adult woman walking on a moderate speed and walking on the sidewalk. She stopped by a tree, checked it then continued walking. She entered the park to reach the other side of the area. She entered in an apartment.

- **Id :111837, October 04, 2019 Friday at 11:18:37 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. He was an elderly man. He was walking on a slow speed. He only used the sidewalk. He entered the park.

- **Id :165758, October 04, 2019 Friday at 16:57:58 from B3**

A tracked walking trip starting from the observation point B3 in Zone B. She was an adult woman who was wearing casual clothes. She was searching for the localization using her phone, at that time she was walking on slow speed. She was walking on the sidewalk. She entered in a store.

- **Id :114321, October 01, 2019 Tuesday at 11:43:21 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. He was an elderly man holding a newspaper. He was walking on the road. In the last part of his path, he was walking on the sidewalk. He was so attentive to cars, and cross when it's possible. He was looking around the street. The observation ended while she was walking.

- **Id :113731, October 02, 2019 Wednesday at 11:37:31 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. He was an adult man who was wearing casual clothes. He was walking on the road: the road was empty and the sidewalk was narrow. Later, he was walking on the sidewalk. People on that area were walking on both road and sidewalk. The observation ended while she was walking.

- **Id :173601, October 02, 2019 Wednesday at 17:36:01 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. She was an adult woman. At first, she was walking on the sidewalk, until a construction site. She was walking on the road. She crossed the street at red traffic light which was the case for other as other pedestrians too. The road was almost empty.

- **Id :113801, October 03, 2019 Thursday at 11:38:01 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. He was an adult man. He was walking on a moderate speed. At first, he was walking on the sidewalk, then on the road. He checked a garbage. He went to the park.

- **Id :173322, October 03, 2019 Thursday at 17:33:22 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. She was a young woman who was wearing casual clothes and holding shopping bags. She was walking on a slow speed. She was walking on the sidewalk, then dropped off the road because of an obstacle (garbage). During her walk, she was on her phone: checking and writing. He entered in a grocery then apartment.

- **Id :114616, October 04, 2019 Friday at 11:46:16 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. He was an elderly man walking on a moderate speed. Most of time, he was walking on the sidewalk. He went to the park.

- **Id :172621, October 04, 2019 Friday at 17:26:21 from B4**

A tracked walking trip starting from the observation point B4 in Zone B. She was a child with a member of her family(grandfather). They were walking on the sidewalk. She was playing on the sidewalk, talking with her grandfather. They greeted someone, they seem to be from the area. At crossing points, they wait for cars and crossed when it was empty. They went to the park.

- Id :135857, September 30, 2019 Monday at 13:58:57 from B5

A tracked walking trip starting from the observation point B5 in Zone B. She was an adult woman who wearing casual clothes and with 2 dogs. She was walking on a slow speed. She was walking on the sidewalk. At crossing point, she waited the traffic light to turn red. She was walking on the sidewalk. Most people from that area were walking on the sidewalk. The sidewalk was narrow enough for people to walk. She met someone and greeted him, then continued her path. She entered in a two banks.

- Id :165112, September 30, 2019 Monday at 16:51:12 from B5

A tracked walking trip starting from the observation point B5 in Zone B. She was an adult woman with someone. While walking, she was talking and pushing a baby stroller. They were walking on the wide side of the pedestrian street. At that time, the area was crowd of people. She used the slope to push the stroller and dropped off the sidewalk. She was walking on the road. The sidewalk wasn't wide enough to walk and push the stroller. She was giving priority to cars. The observation ended while she was walking.

- Id :140221, October 01, 2019 Tuesday at 14:02:21 from B5

A tracked walking trip starting from the observation point B5 in Zone B. She was a young woman. She was walking on the pedestrian street, then on the sidewalk. She entered in pharmacy and an art center.

- Id :141315, October 01, 2019 Tuesday at 14:13:15 from B5

A tracked walking trip starting from the observation point B5 in Zone B. He was an adult man. He was walking on the pedestrian street, then on the sidewalk. and was looking around cafes; they were many cafes and pubs in the area. He entered a bank and a pub. At crossing point, he waited the traffic light to turn green.

- Id :165816, October 01, 2019 Tuesday at :16:58:16 from B5

A tracked walking trip starting from the observation point B5 in Zone B. He was an adult man walking on moderate speed. Most people of that area were walking on the same speed. He was walking on the road then the pedestrian street. People at that

area were walking on the sidewalk. He stopped and talked on the phone for 30 seconds. He continued walking to the cafes.

- Id :140325, October 02, 2019 Wednesday at 14:03:25 from B

A tracked walking trip starting from the observation point B5 in Zone B. She was an adult woman holding shopping bag and with her friend. She was walking on a slow speed. At first, she was walking on the sidewalk, then she was walking on the road. She let cars pass. She used the ramp, curb. The observation ended while she was walking.

- Id :162922, October 02, 2019 Wednesday at 16:29:22 from B5

A tracked walking trip starting from the observation point B5 in Zone B. He was an adult man who was holding shopping bags. He was walking on the sidewalk and walking on a moderate speed. The area was crowd of people. During her walk, he was looking around: he even stopped by a pastry place, had a look and continued walking. The observation ended while he was walking.

- Id :165121, October 02, 2019 Wednesday at 16:51:21 from B5

A tracked walking trip starting from the observation point B5 in Zone B. He was an elderly man walking on slow speed. He seems to be from the area, he met someone, talked and then he continued walking. The observation ended while he was walking.

- Id :142118, October 03, 2019 Thursday at 14:21:18 from B5

A tracked walking trip starting from the observation point B5 in Zone B. She was an adult woman. She was walking on the sidewalk. Only one time, she dropped off the sidewalk.

- Id :163347, October 03, 2019 Thursday at 16:33:47 from B5

A tracked walking trip starting from the observation point B5 in Zone B. She was a young woman with someone. They were walking on the sidewalk on a moderate speed and talking. She was holding her phone. The observation ended while she was walking.

- Id :141001, October 04, 2019 Friday at 14:10:01 from B5

A tracked walking trip starting from the observation point B5 in Zone B. She was a woman, elderly and walking with her husband. They were looking around and enjoying the walk. They walked on a slow speed. They walked on the pedestrian street. They entered to an apartment.

- Id :164217, October 04, 2019 Friday at 16:42:17 from B5

A tracked walking trip starting from the observation point B5 in Zone B. He was a young man talking on his phone all the way. He was walking first on the sidewalk and pedestrian street. On that area, people are walking on sidewalk and pedestrian street too. He was passing people. Then, he was walking on the road, there were few cars. He was walking on moderate speed. The observation ended while he was walking.

- Id :143909, September 30, 2019 Monday at 14:39:09 from B6

A tracked walking trip starting from the observation point B6 in Zone B. She was a young female holding her phone. She got a phone call. She was walking fast and on the sidewalk. The observation ended while she was walking.

- Id :162440, September 30, 2019 Monday at 16:24:40 from B6

A tracked walking trip starting from the observation point B6 in Zone B. He was a young man who wearing casual clothes. He entered a supermarket, a small shop, then continued walking. He was walking on the sidewalk and crossing in the middle of the street. He didn't cross at road intersection. At the last part of his path, he was walking on the road, it is a residential area: cars were few and the sidewalk was narrow. The observation ended while she was walking.

- Id :143347, October 01, 2019 Tuesday at 14:33:47 from B6

A tracked walking trip starting from the observation point B6 in Zone B. He was an elderly man. He was looking around as if he was looking for something. He was holding his phone and checking it many times. Sometimes, he was walking on the sidewalk, sometimes no. The observation ended while he was walking.

- **Id :145050, October 01, 2019 Tuesday at 14:50:50 from B6**

A tracked walking trip starting from the observation point B6 in Zone B. He was an adult man. He was walking on the sidewalk. At road intersection, he didn't wait for the traffic light to turn green, he crossed when it was empty.

- **Id :162504, October 01, 2019 Tuesday at 16:25:04 from B6**

A tracked walking trip starting from the observation point B6 in Zone B. She was an adult woman listening to music and walking fast and looking around. She was walking on the sidewalk. She was about to cross the road, but the car didn't let her pass. The observation ended while she was walking.

- **Id :143841, October 02, 2019 Wednesday at 14:38:41 from B6**

A tracked walking trip starting from the observation point B6 in Zone B. She was an adult woman with her friend. She was pushing a stroller and was walking most of the time on the sidewalk.

- **Id :145553, October 02, 2019 Wednesday at 14:55:53 from B6**

A tracked walking trip starting from the observation point B6 in Zone B. She was an elderly woman with a friend/ neighbor. They were talking. She was holding empty shopping bags and pushing a shopping stroller. She was walking on the road: moving from right to left, left to right following the shadow on the street.

- **Id :160956, October 02, 2019 Wednesday at 16:09:56 from B6**

A tracked walking trip starting from the observation point B6 in Zone B. She was a young woman. At first, she was holding her phone, then started talking on her phone. She was fast and walking on the sidewalk. She was looking round the surrounding environment. The observation ended while she was walking.

- **Id :144735, October 03, 2019 Thursday at 14:47:35 from B6**

A tracked walking trip starting from the observation point B6 in Zone B. He was a young man; he was very attentive on the street. He was walking on the sidewalk. In

the last part of the sidewalk, she dropped off the sidewalk. At crossing point, he either waited the traffic light to turn green or waited for cars in case of no traffic light. The observation ended while she was walking.

- Id :162216, October 04, 2019 Friday at 16:22:16 from B6

A tracked walking trip starting from the observation point B6 in Zone K. She was woman, young who was wearing casual clothes walking with someone and pushing a baby stroller. She was walking on the sidewalk, but because the sidewalk was narrow and not comfortable for walking, she dropped off the sidewalk. She entered in a park.

